OCTOBER, 1959

Commercial Fertilizer

and PLANT FOOD INDUSTRY

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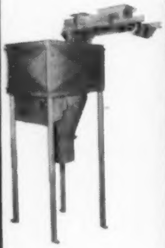

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President
ERNEST H. ABERNETHY

Editor and General Manager
CLAY W. PENICK, JR.

Associate Editor
BRUCE MORAN

Business Manager
V. T. CRENSHAW

Chicago Sales Manager
ELON A. ABERNETHY
1753 Howard St.–Room 200
Chicago 26, Illinois
Phone: Rogers Park 4-5616

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Commenting Freely

by BRUCE MORAN

They tell us we should pay more attention to politics; that it is the only protection for business. The big groups of labor, the farm and such represent a lot of votes, but their ideas do not always track along the line of good economics, nor even of the greatest good for the greatest number.

Hence it is interesting to note young Senator Kennedy getting ready to advocate the idea of more control by farmers over the whole process from the soil to the consumer by use of Government-financed cooperatives.

This may be smart politics, but is it sound? How much does a farmer know about getting his produce or livestock to market? If the thing be handled as a democratic process, how much of a mess can ensue when emotions, rather than hard facts control the vote?

This can become a problem, and is something to think about before the conventions come along and pin such ideas to the masthead.

JUST AROUND THE CORNER

By Vernon Mount

If the visit of Nikita does nothing else, it should make Americans pull closer together to meet the competitive challenge to our industrial supremacy. A dictator has the edge in one important way – he can issue orders. There can be no conflict between capital or labor. People may drag their feet – but in the long run that can lead to Siberia.

If we are to remain as the leader for world peace, we must remain supreme industrially. We are big and strong. We must stay that way. And the only way to hold the line is to have voluntary unity of purpose among us, to match the enforced unity of the dictatorships.

For the most part we do this – but not always. When factions ride off in all directions, progress is halted. That is true of labor and management. It is true of inter-service conflicts of the Army-Navy-Airforce.

Yours faithfully,

Vernon Mount


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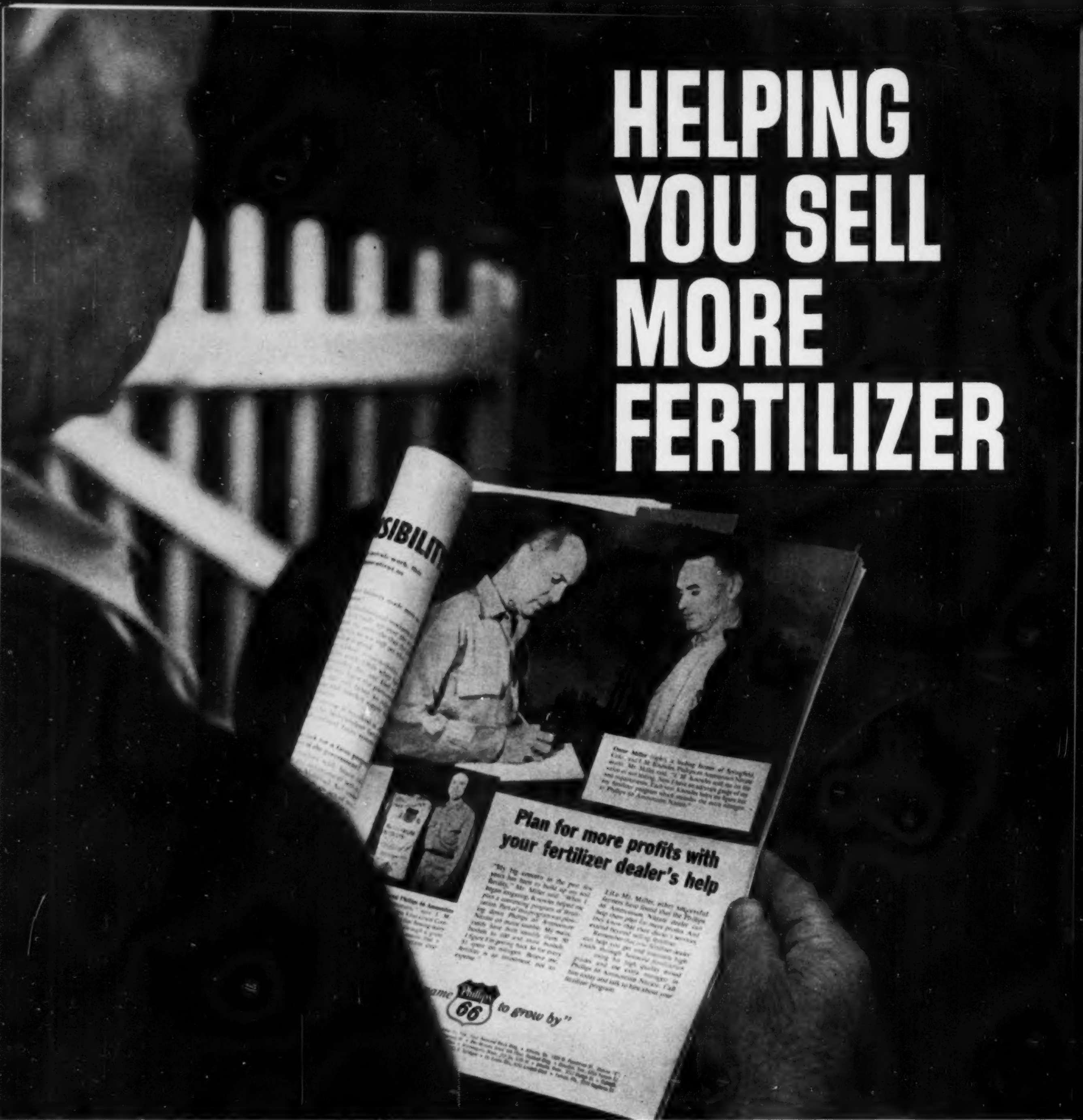

PHILLIPS 66

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This farmer is reading a Phillips *66* Ammonium Nitrate ad. Although it advertises the superior qualities of Phillips *66* Ammonium Nitrate, it also emphasizes farmer-dealer planning of a balanced fertilization program . . . and the importance of good soil management through the use of mixed fertilizers as well as supplemental straight nitrogen.

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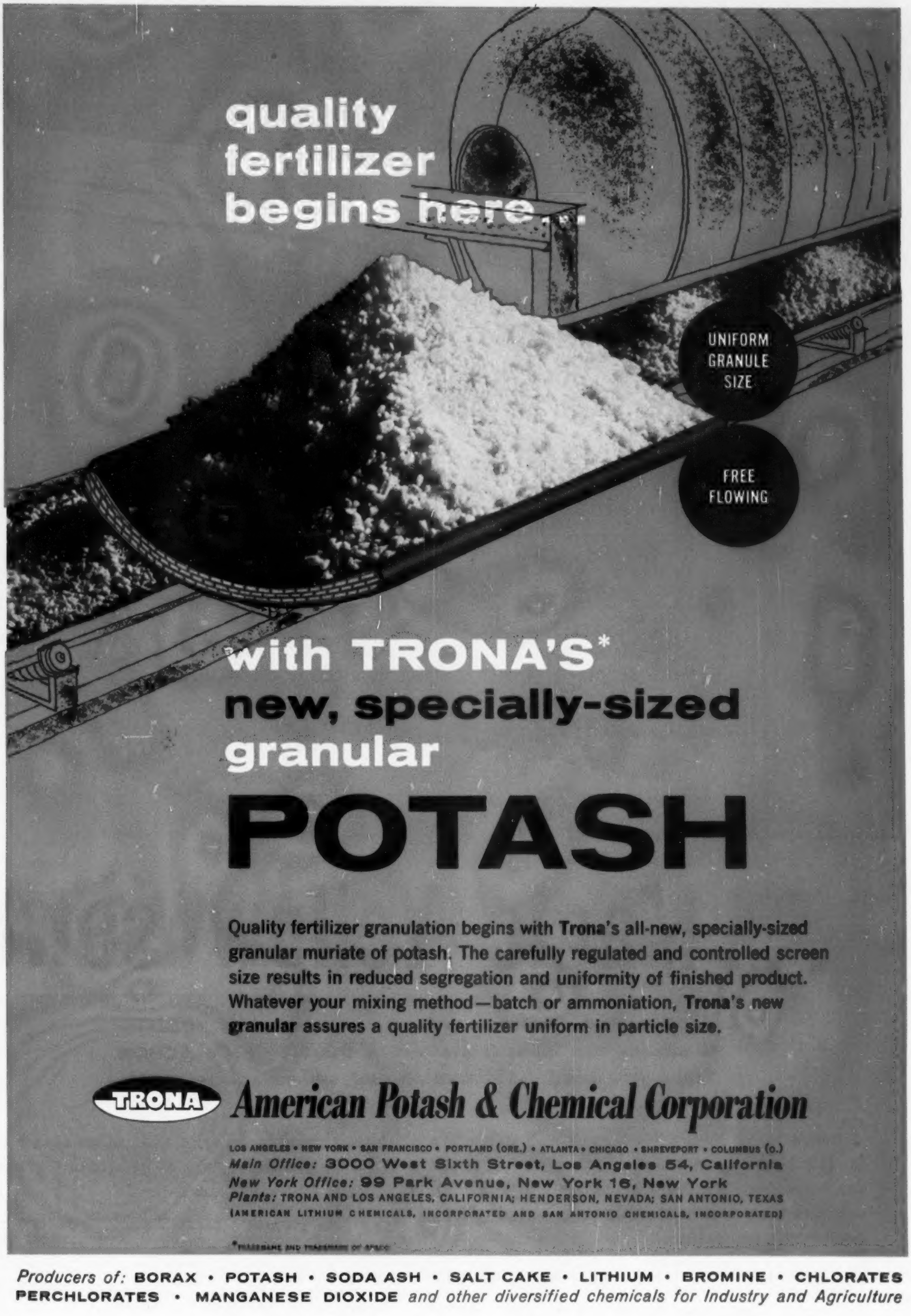

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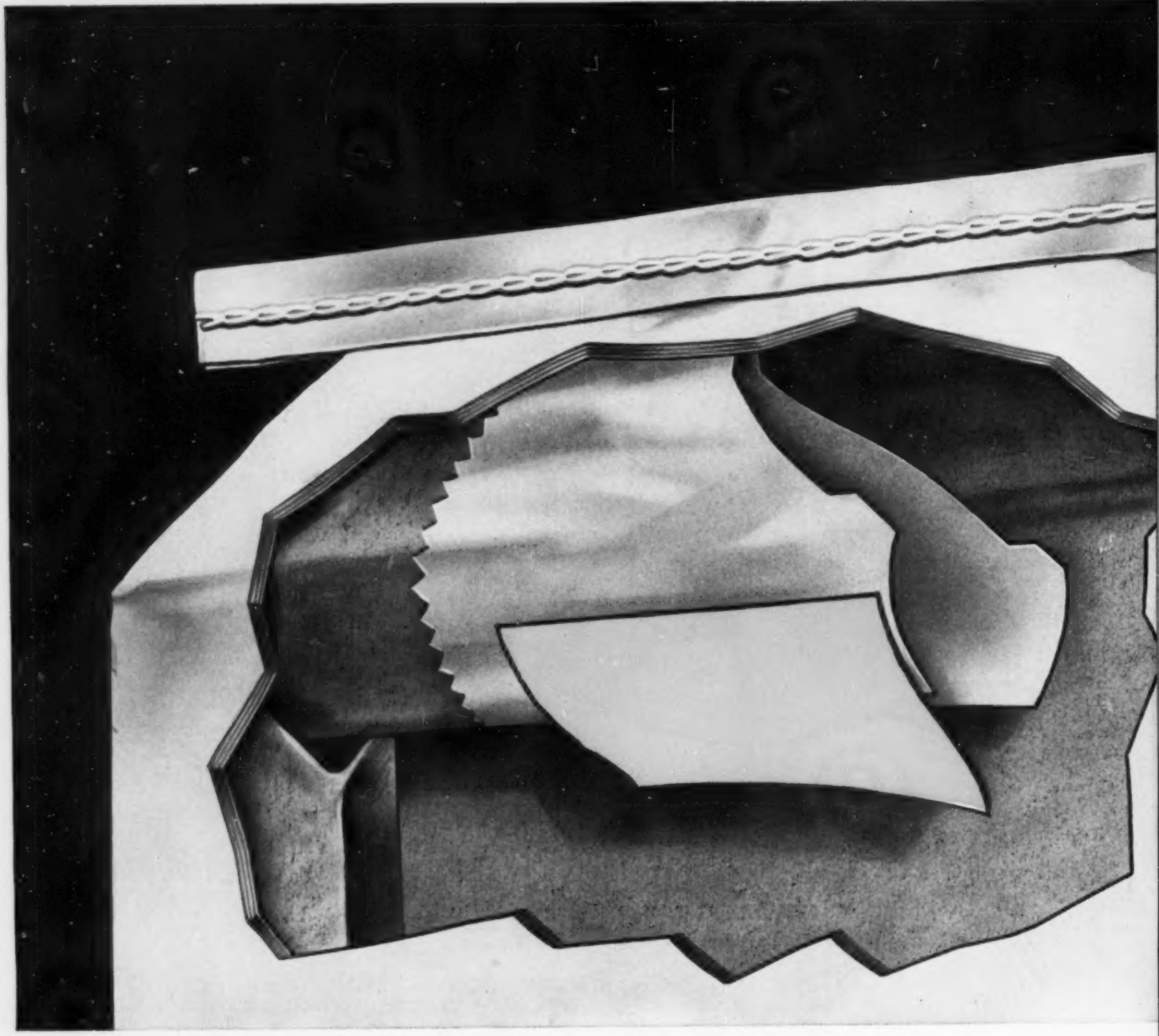

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Write us for the *complete* story, or ask your Bemis Man. Samples on request.

Table 1. Kinds of fertilizers consumed in regions and United States, year ended June 30, 1958[1]

Consumption of Commercial Fertilizers and Primary Plant Nutrients in the United States, year ended June 30, 1958

by
Walter Scholl, Marion M. Davis, Esther I. Fox, *and* Anna W. Woodard
Fertilizer Investigations Research Branch
Soil and Water Conservation Research Division
Agricultural Research Service
U. S. Department of Agriculture
Beltsville, Maryland

The consumption of fertilizers and primary plant nutrients (N, P_2O_5, K_2O) is reported by individual States, the District of Columbia, Hawaii, and Puerto Rico, for the year ended June 30, 1958. Data for Alaska were not available. It is thought that less than 2,000 tons of fertilizers are being used there which are not included in these totals.

The data were compiled from information furnished by manufacturers on the tonnages of each kind and grade of product shipped to agents, dealers, and consumers in all the areas tabulated except California, Florida, Massachusetts, Missouri, North Carolina, South Carolina, Texas, and Virginia. The data for these States were compiled chiefly from the reports of the respective fertilizer-control officials. Supplementary information was supplied by State agencies and fertilizer brokers. Special inquiries were made of all known distributors and custom applicators of anhydrous ammonia and nitrogen solutions.

The quantities of N, P_2O_5, and K_2O are based on the average analyses of samples of the products as reported by fertilizer-control officials of the respective State in which they were consumed, rather than on the manufacturers' guarantees. Thus, the overruns or underruns of nutrients from the guarantees are taken into account.

Quantities are reported as 2,000-pound tons. Although the data refer to shipments, the terms "consumption," "sales", and "shipments" are used synonymously. Actual consumption differs slightly, no doubt, from either shipments or sales.

All Fertilizers

The total quantity of fertilizer consumed in the year ended June 30, 1958, was 22,515,763 tons (table 1). It comprised 21,576,035 tons of products containing one or more of the primary nutrients and 939,728 tons of secondary and trace nutrient materials. Consumption of fertilizers containing primary nutrients was 189,733 tons (0.9 percent) below that (21,765,768 tons) in 1956-57. The quantity of the secondary and trace nutrient materials was 3,515 tons (0.4 percent) below that (943,243 tons) used in 1956-57.

Table 2. — Regional change in consumption of fertilizers in year ended June 30, 1958, from that in the preceding year

Region	Change from previous year in consumption as:					
	Mixtures	Materials*	Total*	Mixtures	Materials*	Total*
	Tons	Tons	Tons	Percent	Percent	Percent
New England	3,585	—552	3,033	1.0	—0.8	0.7
Middle Atlantic	—17,414	4,299	—13,115	—1.0	2.2	—.7
South Atlantic	—196,487	—56,811	—253,298	—4.1	—5.6	—4.4
East North Central	8,577	114,172	122,749	.3	9.2	2.7
West North Central	—17,374	148,280	130,906	—1.4	15.4	6.0
East South Central	—116,051	—132,547	—248,598	—6.1	13.8	—8.7
West South Central	—1,047	22,111	21,064	—.2	3.2	1.6
Mountain	12,760	61,253	74,013	22.6	16.4	17.2
Pacific	27,480	73,841	101,321	7.9	5.3	5.8
Total	**—295,971**	**234,046**	**—61,925**	**—2.0**	**3.4**	**—.3**
Hawaii	—5,221	—66,675	—71,896	—8.0	—52.7	—37.5
Puerto Rico	—48,592	—7,320	—55,912	—21.1	—12.2	—19.3
United States	**—349,784**	**160,051**	**—189,733**	**—2.4**	**2.3**	**—.9**

* Excluding the quantity of secondary and trace nutrient materials.

The changes in consumption of the classes of fertilizers containing primary nutrients in 1957-58 as compared with 1956-57 are summarized by regions in table 2. The national decrease in total consumption in 1957-58 was due to a decrease of 349,784 tons (2.4 percent) of mixtures, which was partly offset by an increase of 160,051 tons (2.3 percent) of direct application materials. This was the fifth consecutive year since the peak of 1952-53 that the quantity of mixtures had decreased. The consumption of direct application materials, however, has increased annually except in 1952-53 and 1953-54. The decrease in total consumption was chiefly in the South Atlantic and East South Central regions. The consumption in the North Central, Mountain, and Pacific regions continued to make large gains.

As shown in table 3 (column 9), consumption of fertilizers containing primary nutrients increased in 27 and decreased in 23 areas. In comparison with 1956-57, the increases ranged up to 55 percent (District of Columbia), while the decreases ranged to 37 percent (Hawaii). In the areas showing increases, 669,995 tons (7.7 percent) more fertilizer were consumed, while in the areas showing decreases the consumption was 859,728 tons (6.6 percent) lower —resulting in a net decrease of 189,733 tons (0.9 percent). As in 1956-57, the tonnage was higher in most of the Northern and Western States and generally lower in the Southeastern States.

Compared with the consumption in each six-month period of 1956-57, mixtures decreased by 283,543 tons (7.6 percent) in the July-December period and by 66,241 tons (0.6 percent) in the January-June period. Consumption of primary nutrient materials was higher by 138,249 tons (5.8 percent) and 21,802 tons (0.5 percent) in these periods, respectively.

Mixtures

In 1957-58 the total consumption of commercial mixtures amounted to 14,353,023 tons (table 3). There were 1,698 grades reported. In addition, over 500 mixtures, many of which are duplicated in the above total but were not reported by grades, were used in California and an unknown number was reported as miscellaneous tonnages in other States. Mixtures consumed in 1957-58 represented 63.7 percent of the quantity of all fertilizers compared with 64.7 percent for the preceding year.

The total consumption of mixtures

Table 1.—Kinds of fertilizers consumed in regions and United States, year ended June 30, 1958[1]

Tons

Kind	New England	Middle Atlantic	South Atlantic	East North Central	West North Central	East South Central	West South Central	Mountain	Pacific	Hawaii and Puerto Rico [2]	United States
MIXTURES: N-P-K	336,487	1,622,205	4,227,965	3,045,300	995,486	1,611,294	570,566	37,023	290,215	204,828	12,941,369
N-P	26	321	156	49,765	140,017	5,459	32,037	31,534	80,158	2,112	341,585
P-K	30,365	105,584	178,045	230,400	67,163	175,412	28,817	545	2,992	3,732	823,055
N-K	0	59	209,753	429	79	3,375	7	48	2,253	31,011	247,014
CHEMICAL NITROGEN MATERIALS											
Ammonia, anhydrous	0	2,485	25,175	57,151	139,082	51,832	139,927	42,754	124,256	772	583,434
Ammonia, aqua	0	0	846	2,261	9,401	46	7,844	26,937	289,640	28,087	365,062
Ammonium nitrate[3]	4,780	31,816	136,369	138,098	243,040	284,077	106,142	70,272	102,314	0	1,116,908
Ammonium nitrate-limestone mixtures	162	2,195	223,944	2,025	173	30,797	534	3,622	60	0	263,512
Ammonium sulfate	531	4,499	11,673	97,108	11,771	11,922	97,778	63,170	226,004	52,655	577,111
Calcium cyanamide	1,379	9,033	8,858	1,028	189	9,642	6,467	1,173	8,579	0	46,348
Calcium nitrate	2	2	10,118	115	0	146	132	11,960	34,788	111	57,374
Nitrogen solutions	904	3,692	83,748	59,373	82,673	9,420	22,686	5,668	56,382	0	324,546
Sodium nitrate	1,582	10,307	241,814	1,382	286	129,968	49,157	493	386	134	435,509
Urea	1,076	3,661	3,814	11,950	3,796	1,212	18,700	19,034	27,044	8,096	98,383
Other	234	2,214	872	2,805	600	37	472	976	980	0	9,190
NATURAL ORGANIC MATERIALS											
Blood, dried	3	29	35	0	0	0	0	19	2,170	0	2,256
Castor pomace	1,519	219	2,600	0	0	25	0	0	920	0	5,283
Compost[4]	476	505	0	7,176	4,049	0	2,342	370	1,920	0	16,838
Cottonseed meal[4]	6,517	183	1,502	0	0	5	0	0	30	0	8,237
Fish scrap, meal, emulsions	423	16	0	15	0	0	0	8	1,270	0	1,732
Manures, dried	4,630	13,732	4,215	7,804	4,383	1,157	2,619	2,190	261,786	0	302,516
Sewage sludge, activated	7,403	14,421	8,732	30,512	8,161	1,034	3,388	4,690	18,567	100	97,008
Sewage sludge, other	0	0	0	740	92	19	0	265	35,621	0	36,737
Tankage, animal	7	410	1	0	0	0	0	0	1,450	0	1,868
Tankage, process	3,366	7,751	3,779	397	1	0	0	0	0	10	15,304
Other	751	138	1,015	0	0	0	8	100	3,461	0	5,473
PHOSPHATE MATERIALS											
Ammonium phosphate: 11-48[5]	0	454	45	9,628	45,025	11	3,539	9,158	14,111	1,095	83,066
Ammonium phosphate: 13-39[5]	0	0	0	220	18,372	24	14,935	5,759	6,166	0	45,476
Ammonium phosphate sulfate: 16-20[5]	0	0	0	948	74,635	73	67,317	46,996	104,785	261	295,015
Ammonium phosphate nitrate: 27-14[5]	0	0	0	0	3,212	0	0	4,336	10,135	0	17,683
Ammoniated superphosphate[6]	0	0	37	0	0	0	0	0	3,012	0	3,049
Basic slag	0	0	18,900	0	0	122,000	3,322	0	0	0	144,222
Bonemeal: raw and steamed	1,469	4,115	1,260	1,925	243	307	386	2	1,902	0	11,609
Calcium metaphosphate	0	590	2,478	11,617	15,739	14,122	856	272	26	0	45,700
Diammonium phosphate: 21-53[5]	0	113	1,541	3,796	5,502	3,456	3,027	7,803	1,073	1,102	27,413
Phosphoric acid	0	0	0	0	0	0	1,611	10,781	10,675	0	23,067
Phosphate rock	274	7,492	18,204	564,983	215,208	8,968	16,414	80	824	2,804	835,251
Colloidal phosphate	0	80	317	1,383	3,120	7,649	2,915	120	710	0	16,294
Superphosphate: 18%	1,824	7,753	14,896	16,078	16,963	19,340	0	0	3,442	0	80,296
Superphosphate: 19%	6,556	50	9,276	0	14	105	0	8,766	67,173	0	91,940
Superphosphate: 20-22%	21,907	61,165	26,257	42,988	24,572	56,122	58,708	6,879	1,309	5,747	305,654
Superphosphate: 23-41%	50	0	0	3,499	636	0	577	1,771	29	0	6,562
Superphosphate: 42-44%	0	0	0	0	21,038	0	1	28,196	7,668	0	56,903
Superphosphate: 45%	1	887	120	24,324	40,540	700	19,899	38,523	16,188	2	141,184
Superphosphate: 46%	60	2,013	5,427	44,231	68,527	2,427	20,660	4,504	3,643	1,725	153,217
Superphosphate: 47-48%	0	25	158	4,389	1,981	3,046	1,775	4,745	0	0	16,119
Superphosphate: 49-52%	0	0	0	238	84	38	18	0	0	0	378
Other	256	0	2,845	0	0	577	0	0	69	0	3,747
POTASH MATERIALS											
Cotton hull ashes	318	0	0	0	0	0	0	0	0	0	318
Lime-potash mixtures[7]	0	91	20,957	0	0	6,280	0	0	0	0	27,328
Manure salts	0	5	324	0	0	0	28	0	0	0	357
Potassium chloride: 50%	152	219	354	4,198	299	326	561	140	145	0	6,394
Potassium chloride: 60%	1,678	4,625	35,252	187,179	45,095	40,956	28,348	1,492	5,884	7,887	358,396
Potassium magnesium sulfate	68	1,354	1,981	3,369	355	1,137	1,245	41	264	5	9,819
Potassium sodium nitrate[6]	174	1	13,290	39	0	1,256	18	0	0	0	14,778
Potassium sulfate	114	1,319	5,246	3,480	2	6,411	120	1,125	6,864	2,106	26,787
Other	4	14	2,659	1,116	0	0	441	0	127	0	4,361
TOTAL: PRIMARY NUTRIENT FERTILIZERS	**437,528**	**1,927,842**	**5,566,853**	**4,675,462**	**2,311,604**	**2,622,210**	**1,336,344**	**504,340**	**1,839,470**	**354,382**	**21,576,035**
SECONDARY & TRACE NUTRIENT MATERIALS											
Aluminum sulfate[4]	4	8	7	0	0	0	0	0	53	0	72
Borax[4]	47	165	337	193	49	418	25	0	630	0	1,864
Calcium sulfate (gypsum)	101	3,238	99,307	1,717	135	2,132	810	39,008	742,252	2	888,702
Copper sulfate[4]	0	64	208	36	0	1	1	0	202	0	512
Iron sulfate[4]	0	0	105	0	0	0	15	549	2,308	2,311	5,288
Magnesium sulfate[4]	28	250	114	33	0	0	3	5	64	117	614
Manganese sulfate[4]	2	136	57	430	0	0	1	0	43	0	669
Mixed minerals[4]	0	19	1,097	15	266	7	102	651	3,864	0	6,021
Sulfur: 25-99% S	7	32	195	1	38	2	3,281	1,585	16,409	0	21,550
Sulfuric acid: 40-93%	0	0	0	0	0	0	834	2,674	964	0	4,472
Zinc sulfate[4]	0	27	216	1	4	85	3	3	3,254	66	3,659
Other	0	0	31	107	0	0	0	2,235	3,932	0	6,305
SECONDARY & TRACE NUTRIENT MATERIALS	**189**	**3,939**	**101,674**	**2,533**	**492**	**2,645**	**5,075**	**46,710**	**773,975**	**2,496**	**939,728**
GRAND TOTAL	**437,717**	**1,931,781**	**5,668,527**	**4,677,995**	**2,312,096**	**2,624,855**	**1,341,419**	**551,050**	**2,613,445**	**356,878**	**22,515,763**

[1]Including 1,030 tons of 30-10-0 grade, 6,100 tons of calcium metaphosphate, 4,625 tons of diammonium phosphate, and 297 tons superphosphate (48%) distributed by Government agencies for test demonstrations. Does not include liming materials or the quantities of materials used for the manufacture of the indicated quantities of commercial mixtures. The primary plant nutrient content of mixtures is shown in table 11, and of the principal materials in table 13. [2]Consumption in Alaska was not available. It is estimated to be not more than 2,000 tons. Consumption in U. S. possessions considered negligible. [3]Minor quantities may have been used for other purposes than fertilizer. [4]Distributed by manufacturers of fertilizers. [5]Including quantities reported as mixtures. [6]Additional quantities may have been reported by grade under mixtures. [7]Additional quantities are given free to farmers for which no records are kept.

Table 3.—Fertilizers consumed as mixtures and as separate materials, year ended June 30, 1958, compared with consumption of previous year, by State and region

State and region	Mixtures[1]			Materials[2]			Grand total	Comparison with total consumption in year ended June 30, 1957	
	July 1-Dec. 31, 1957	Jan. 1-June 30, 1958	Total	July 1-Dec. 31, 1957	Jan. 1-June 30, 1958	Total		Fertilizer[3]	N, avail. P_2O_5 & K_2O
	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Percent	Percent
Maine	11,497	159,377	170,874	4,258	3,736	7,994	178,868	104	107
New Hampshire	2,550	13,319	15,869	1,124	3,069	4,193	20,062	103	103
Vermont	5,026	35,166	40,192	12,776	4,581	17,357	57,549	104	103
Massachusetts	12,149	55,744	67,893	6,040	13,050	19,090	86,983	101	100
Rhode Island	2,144	13,065	15,209	630	1,469	2,099	17,308	102	102
Connecticut	7,727	49,114	56,841	4,227	15,879	20,106	76,947	91	96
New England	**41,093**	**325,785**	**366,878**	**29,055**	**41,784**	**70,839**	**437,717**	**101**	**103**
New York	120,979	430,694	551,673	27,854	56,071	83,925	635,598	110	110
New Jersey	39,288	153,349	192,637	6,979	15,961	22,940	215,577	80	82
Pennsylvania	174,512	401,807	576,319	24,093	41,907	66,000	642,319	101	102
Delaware	13,303	65,459	78,762	1,129	2,547	3,676	82,438	94	94
District of Columbia	1,128	1,879	3,007	492	502	994	4,001	155	170
Maryland	66,159	195,231	261,390	5,295	11,413	16,708	278,098	95	97
West Virginia	11,629	52,752	64,381	2,695	6,674	9,369	73,750	90	90
Middle Atlantic	**426,998**	**1,301,171**	**1,728,169**	**68,537**	**135,075**	**203,612**	**1,931,781**	**99**	**100**
Virginia	128,722	480,431	609,153	17,930	78,354	96,284	705,437	91	95
North Carolina	171,108	1,029,363	1,200,471	40,509	269,822	310,331	1,510,802	97	100
South Carolina	84,690	440,709	525,399	32,189	175,164	207,353	732,752	90	92
Georgia	192,037	792,594	984,631	52,111	221,559	273,670	1,258,301	97	100
Florida	513,858	782,407	1,296,265	61,414	103,556	164,970	1,461,235	99	102
South Atlantic	**1,090,415**	**3,525,504**	**4,615,919**	**204,153**	**848,455**	**1,052,608**	**5,668,527**	**96**	**99**
Ohio	262,952	686,660	949,612	27,931	75,059	102,990	1,052,602	102	102
Indiana	227,128	623,308	850,436	53,074	178,673	231,747	1,082,183	100	103
Illinois	144,813	409,998	554,811	431,319	467,648	898,967	1,453,778	106	110
Michigan	170,679	405,371	576,050	19,197	53,713	72,910	648,960	102	104
Wisconsin	46,663	348,322	394,985	12,638	32,849	45,487	440,472	103	106
East North Central	**852,235**	**2,473,659**	**3,325,894**	**544,159**	**807,942**	**1,352,101**	**4,677,995**	**103**	**105**
Minnesota	41,291	278,920	320,211	31,838	91,257	123,095	443,306	104	106
Iowa	46,323	293,274	339,597	57,337	145,158	202,495	542,092	117	118
Missouri	146,859	253,762	400,621	188,489	167,003	355,492	756,113	94	93
North Dakota	5,533	25,421	30,954	18,838	56,950	75,788	106,742	131	131
South Dakota	947	9,718	10,665	5,068	18,510	23,578	34,243	139	138
Nebraska	6,144	25,598	31,742	48,336	151,975	200.311	232,053	137	135
Kansas	40,833	28,122	68,955	75,147	53,445	128,592	197,547	93	94
West North Central	**287,930**	**914,815**	**1,202,745**	**425,053**	**684,298**	**1,109,351**	**2,312,096**	**106**	**108**
Kentucky	64,274	371,320	435,594	26,009	70,367	96,376	531,970	98	100
Tennessee	95,987	314,026	410,013	32,903	70,569	103,472	513,485	94	93
Alabama	130,317	562,132	692,449	62,409	192,328	254,737	947,186	91	94
Mississippi	18,011	239,473	257,484	150,597	224,133	374,730	632,214	85	84
East South Central	**308,589**	**1,486,951**	**1,795,540**	**271,918**	**557,397**	**829,315**	**2,624,855**	**91**	**92**
Arkansas	21,630	118,246	139,876	41,203	109,529	150,732	290,608	89	91
Louisiana	31,753	115,247	147,000	31,927	97,164	129,091	276,091	96	97
Oklahoma	24,856	33,370	58,226	26,893	21,809	48,702	106,928	99	100
Texas	83,829	202,496	286,325	130,853	250,614	381,467	667,792	112	115
West South Central	**162,068**	**469,359**	**631,427**	**230,876**	**479,116**	**709,992**	**1,341,419**	**102**	**104**
Montana	760	3,684	4,444	12,531	21,239	33,770	38,214	87	91
Idaho	1,291	6,910	8,201	19,804	80,028	99,832	108,033	134	133
Wyoming	192	1,178	1,370	1,344	10,160	11,504	12,874	123	119
Colorado	2,373	11,270	13,643	19,385	48,561	67,946	81,589	134	134
New Mexico	499	2,219	2,718	7,499	29,719	37,218	39,936	106	102
Arizona	9,333	23,233	32,566	63,958	112,412	176,370	208,936	112	120
Utah	950	3,374	4,324	5,034	30,351	35,385	39,709	123	129
Nevada	522	1,362	1,884	15,955	3,920	19,875	21,759	133	161
Mountain	**15,920**	**53,230**	**69,150**	**145,510**	**336,390**	**481,900**	**551,050**	**117**	**120**
Washington	8,405	36,720	45,125	72,690	129,924	202,614	247,739	142	148
Oregon	5,073	23,098	28,171	41,457	122,516	163,973	192,144	89	92
California	103,838	198,484	302,322	891,341	979,899	1,871,240	2,173,562	104	108
Pacific	**117,316**	**258,302**	**375,618**	**1,005,488**	**1,232,339**	**2,237,827**	**2,613,445**	**106**	**111**
Total	**3,302,564**	**10,808,776**	**14,111,340**	**2,924,749**	**5,122,796**	**8,047,545**	**22,158,885**	**100**	**103**
Hawaii	38,641	21,566	60,207	43,247	19,004	62,251	122,458	63	66
Puerto Rico	79,632	101,844	181,476	26,680	26,264	52,944	234,420	81	82
United States: 1957-58	3,420,837	10,932,186	14,353,023	2,994,676	5,168,064	8,162,740	22,515,763	99	102
1956-57	3,704,380	10,998,427	14,702,807	2,875,726	5,130,478	8,006,204	22,709,011	100	100
1955-56	3,545,913	11,229,740	14,775,653	2,508,638	4,909,679	7,418,317	22,193,970	98	95

[1]The classes of mixtures are listed in table 1 and the principal grades in tables 4 and 5. [2]The kinds of materials are listed in tables 1 and 8. Quantities include the primary nutrient (N, P_2O_5, K_2O) materials and the secondary and trace nutrient materials. [3]Fertilizers which were guaranteed to contain one or more of the primary nutrients.

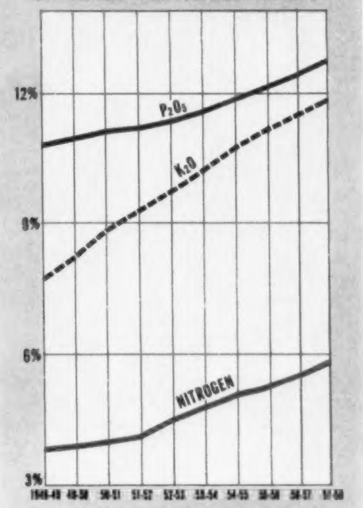
Arcadian® News

Volume 4 | For Manufacturers of Mixed Fertilizers | Number 10

The No. 1 Need of Most Crops

More N in N-P-K

AVERAGE PLANT FOOD CONTENT OF MIXED FERTILIZER IN U.S.



Consumption of all three major plant foods has risen rapidly in recent years, as farmers use more fertilizer to produce higher yields per acre. But, yields and profits from fertilizer are still far below the maximum returns that can be produced with fertilizer.

The reason is simple. Most crops do not get the amounts and analyses of fertilizers they need to produce optimum yields and profits. *The average fertilizer is far too low in nitrogen.* In addition to failing to supply the nitrogen needs of crops, it also limits the efficiency of its phosphorus and potash content because these plant foods cannot function properly without sufficient nitrogen available to crops.

The leading fertilizer-consuming crops need more nitrogen than any other plant food. Corn, wheat and cotton require more than twice as much nitrogen as phosphoric acid, and much more nitrogen than potash. Modern grazing and hay crops are big users of nitrogen. Animal products produced on farm-grown feeds remove from the soil more nitrogen than phosphoric acid and potash combined.

Yet, in 1957-58, the plant food content of the average mixed fertilizer was 5.95% N, 12.55% P_2O_5, and 11.76% K_2O. If this analysis was used on corn, cotton and wheat, it would supply only about one fourth of the nitrogen needed to balance its phosphoric acid and potash.

Challenge and Opportunity

In the same year, total consumption of materials and mixed goods accounted for 2,292,000 tons of phosphoric acid and 1,935,000 tons of potash. The 2,284,000 tons of nitrogen used was only about one-third to one-half of that needed to balance the other plant foods in supplying crop needs.

And, experiment stations tell us that crops could use much greater amounts of phosphoric acid and potash efficiently and profitably, if these plant foods were balanced with sufficient nitrogen.

It is true that conditions vary. Some crops and soils need more nitrogen than other crops and soils. But the national picture clearly indicates that low-nitrogen content is the chief limiting factor in the ability of the average mixed fertilizer to produce maximum yields and profits.

This situation is a challenge and an opportunity to every fertilizer man. It calls for vision, progressive enterprise and hard selling. Start now to make it your aim and purpose to manufacture *really* complete fertilizers that contain enough nitrogen in balance with other plant foods to produce the best possible return per dollar invested by the farmer. Success in attaining this goal offers rich rewards to you and your customers.

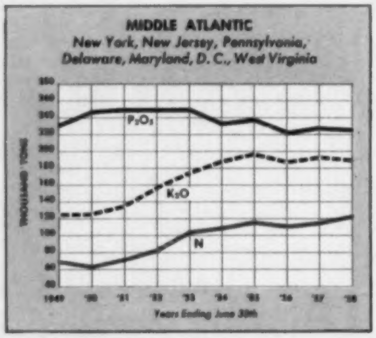
New Ammoniation Techniques

Today it's easier than ever before to put more N in N-P-K. High-quality, high-analysis, high-nitrogen mixed fertilizers can now be manufactured efficiently and economically through the use of new, improved ammoniation techniques. For complete information, contact: Nitrogen Division, Allied Chemical, 40 Rector Street, New York 6, N. Y.

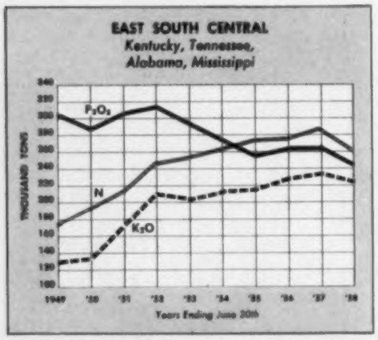
More N in N-P-K can help you sell more and better fertilizers that pay bigger profits to you and the farmer.

TOTAL PLANT FOOD CONSUMED BY EACH AREA OF THE U.S.

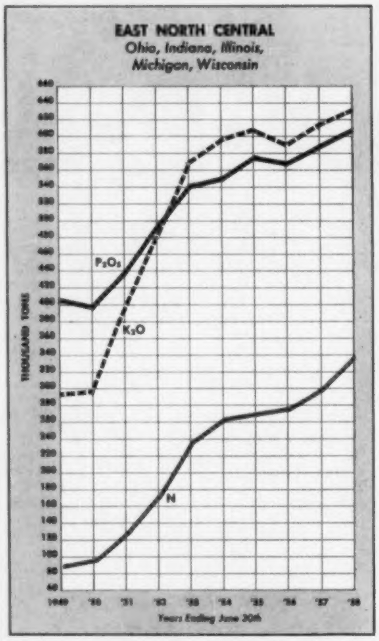
These charts graphically portray the ratio of the three major plant foods for each area of the country, based on figures for total consumption including both mixed fertilizers and straight materials. The figures for the area or areas in which you operate will be helpful to you in assessing the present situation and in making plans for the future. Most of these area charts indicate big potentials for more N in N-P-K.



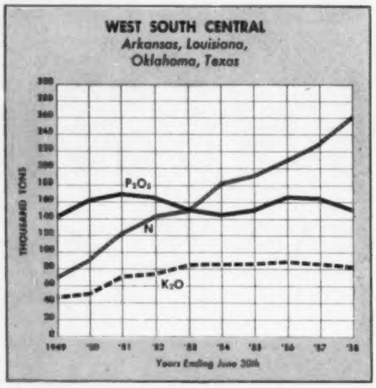
MIDDLE ATLANTIC states have many sections in which high-phosphate fertilizers have built up a soil reserve of this plant food. In New York and New Jersey especially, high-nitrogen fertilizer can make crops get up and grow profits, just as in New England. Since both of these Northeastern areas are traditional users of mixed fertilizer, high-nitrogen combinations fit easily into the sales pattern.



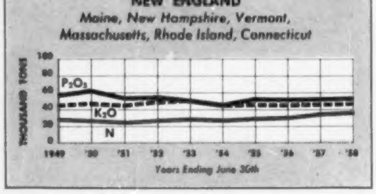
EAST SOUTH CENTRAL states, with the exception of the Mississippi Delta area, are low in fertilizer use. The intensive Delta cash crop area has taken to heavy use of nitrogen and high-nitrogen ratios of plant food. While financing has been no problem on these large farms, the reverse is true on most of the typical small farms of these states. More work to show the value of fertilizer to banks and other groups who are financing farmers can pay off well for fertilizer men.



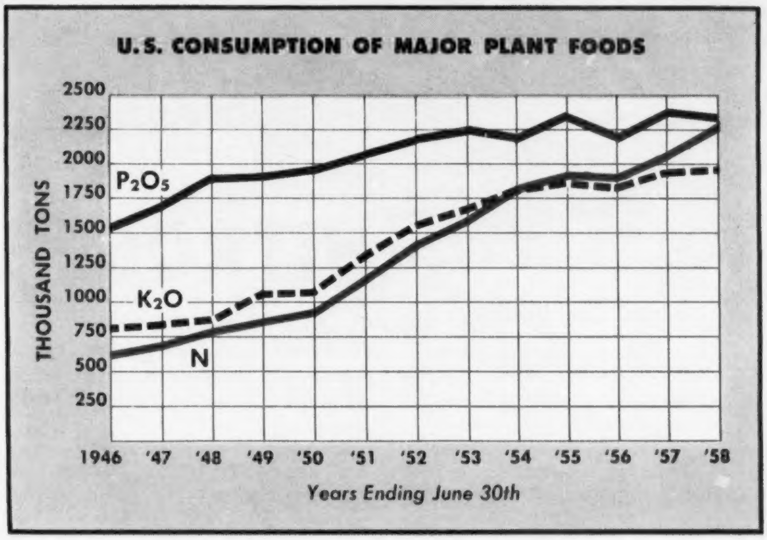
EAST NORTH CENTRAL states show an amazingly low level of nitrogen in fertilizer in proportion to phosphoric acid and potash. In this new fertilizer area, use of all three plant foods is increasing fast, but far more nitrogen is needed to boost crop yields at lowest cost. With intensive cropping of land on the increase, there is a big opportunity to sell more 16-8-8 and other concentrated mixes for grain and grass crops. Experiment stations are beginning to recommend more nitrogen, and legumes cannot furnish it economically. Balanced starter fertilizers should also come fast, with the new planter attachments available.

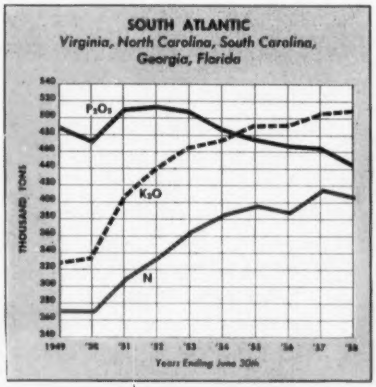


WEST SOUTH CENTRAL states have many large commercial producers of cash crops who have realized the value of balanced fertilizer, as the chart indicates. The use of plant foods has improved fast, and is producing profitable yields of cotton, rice and other crops. Extra sales can be made by demonstrating to the smaller farmers of the area that they too can make money by using a larger tonnage of fertilizer.



NEW ENGLAND soils, with a few cash crop exceptions, are now mostly in grass

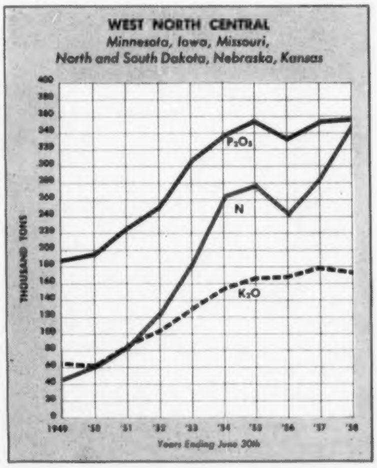




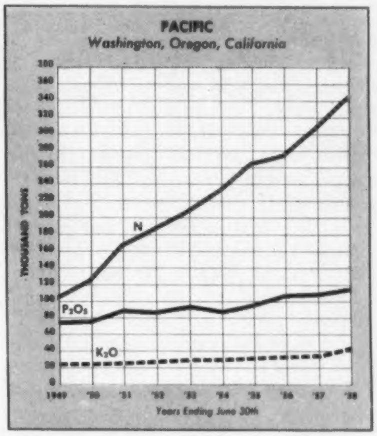
SOUTH ATLANTIC states, with the exception of highly-fertilized tobacco, citrus and vegetable areas, also show similar accumulation of phosphate reserves in the soil. Crop yields are low, indicating the need for more plant food of all kinds. With livestock numbers expanding, grass is becoming the big crop,

and grass-legume mixtures. Traditional use of nitrogen on these old soils has been small. Heavy use of superphosphate has built up a reserve of phosphoric acid in the soil, without greatly increasing yields. On these fields, high-nitrogen fertilizer can make grass yields jump. It can help grass make good use of the phosphorus in the soil and help reverse the downtrend in sales of phosphoric acid in fertilizers. In much of this area, high-nitrogen fertilizer for grass enables this crop to compete economically with legumes in feed produced per acre.

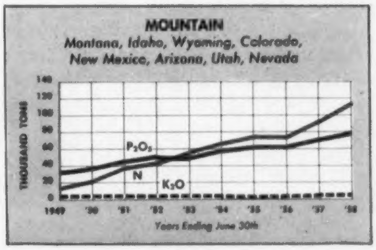
and nitrogen is far less apt to be lost through leaching. Midland and Coastal Bermuda, Bahia, Pensacola and other grasses are a major new market for high-nitrogen mixed fertilizers. And Georgia, for example, aims to grow enough corn for all its cattle and poultry. If farmers move up from 23 bushels per acre, their present average, to 100 bushels per acre on 2,700,000 acres, they will use a lot of fertilizer.



WEST NORTH CENTRAL states are new in fertilizer use, but recent increase in tonnage has been rapid, especially in Missouri and Nebraska. Use of nitrogen is proving profitable on range grass as well as irrigated meadows, corn and other cash crops. Missouri is using considerable nitrogen in proportion to phosphoric acid and potash. Soil supplies of potash have been naturally good in some areas, but heavy cropping will deplete them. Nebraska, with a 3-to-1 ratio of N to P_2O_5, has found heavy use of nitrogen profitable. High fixed costs on irrigated land and rapidly rising land values in the entire area have made more intensive cropping vital. This calls for more fertilizer, especially nitrogen, to cut costs per unit of crop production.



PACIFIC COAST states have taken to fertilizer in a big way, especially California. The combination of irrigation, sunshine and intensive cash crops on large farms has built fertilizer tonnage fast. This area shows the best use of nitrogen in proportion to other plant foods to fit crop needs. It is the nearest to a model area on balance of nutrients. Perhaps some fertilizer men in this area can demonstrate the economies of a balanced mixed fertilizer compared to the practice of using straight materials.



MOUNTAIN states have a wide variety of farm and ranch conditions. Fertilizer use is heaviest in irrigated areas. Balanced fertilizer in ratios to fit the crop and soil conditions can make bigger profits—whether on the range, in mountain meadows or on cash crops.

MODERN CROPS NEED MODERN FERTILIZERS

FARMING is undergoing a revolution in this country. Farms are growing bigger and modern, labor-saving, money-making methods are being rapidly adopted. Yet, many farmers continue to use old-fashioned amounts and ratios of fertilizer. By failing to know and supply the plant food needs of their crops and soils, they limit their return from land, labor, seed and machinery.

The time is ripe for a change to modern fertilizer practices and it is up to the fertilizer industry to help to speed that change. The manufacturer who supplies the farmer with easy-to-use complete fertilizers carefully designed to fit his particular needs helps both himself and his customer to prosper. This requires an accurate knowledge of the exact needs of crops and soils . . . efficient formulation and manufacturing techniques, using modern methods and materials . . . and aggressive promotion, education and selling.

Farmers and farming areas that break with tradition and use improved fertilizer practices are far ahead of the average in yields and profits. And fertilizer manufacturers who foster these improved practices are usually far ahead of the average in sales and profits.

Because the average mixed fertilizer is so low in nitrogen, you can take a giant step toward improved fertilizer practices in your area by producing, promoting and selling grades that contain sufficient nitrogen to supply crop needs for big yields. Many fertilizer manufacturers have found that it pays to double and triple the nitrogen content of mixed fertilizers for certain crops.

It Pays to be Progressive

Ten years ago, who would have suggested 320 pounds of nitrogen per acre of corn, even on irrigated land. Thousands of Nebraska farmers now use it and produce 150 to 200 bushels of corn per acre.

What agronomist 10 years ago would have advised more than 600 pounds of nitrogen per acre of grass. Georgia and South Carolina farmers now use two or more tons of 16-4-8 fertilizer per acre of Coastal Bermuda grass and produce 10 tons or more dry-weight, high-quality forage per acre.

Even timothy hay in the Northeast, once a one-ton, once-a-year crop of low feed value, is now producing four tons of high-protein hay per acre plus months of after-growth grazing, with high-nitrogen mixed fertilizer.

The Pacific Coast states, especially California, use the highest ratio of nitrogen to other plant foods, and California leads all other states in average corn yield, 75 bushels per acre, as compared to 60 for Iowa and 50 for the U. S.

Outstanding Results

Wherever states, counties or individual fertilizer companies have stepped out and really tried to do a better job of supplying the actual plant food needs of crops and soils, results are outstanding. Georgia is an excellent example. In Wisconsin and other corn states, where "prescription" fertilizing has been tried, it is building big yields and big fertilizer sales for entire counties.

New machinery is encouraging the use of heavier applications of high-analysis, high-nitrogen fertilizer. An excellent example is the new planter attachments that apply starter or row fertilizer to one side and deeper than the seed. In tests, 1,000 pounds of 10-10-10 per acre was applied to corn by this method without seed damage. 3-12-12 and 4-16-16 are not efficient when you can supply all the nitrogen the crop needs with one application of high-nitrogen complete fertilizer. One sale replaces two.

For many crops, high-nitrogen mixed fertilizers are now sold in competition with low-nitrogen mixtures plus top-dressing or side-dressing materials. One application does the work of two, saving labor for the farmer and increasing the volume and the profit of the manufacturer and the dealer. Off-season and bulk spreading is just as practical with high-nitrogen mixed fertilizer as with any other material. The era of legumes in short rotations is disappearing as many farmers find it more profitable to buy high-nitrogen fertilizers rather than to spend a year growing a legume crop.

Alert manufacturers and their salesmen and dealers are using soil tests, tissue tests, plant food removal charts and field demonstrations to promote high-nitrogen mixed goods designed to meet exact needs.

The need for nitrogen is nation-wide. It's the No. 1 need of most crops. This need will be supplied with high-nitrogen complete fertilizers or with low-nitrogen mixtures plus straight materials. It will pay you to take the initiative. Start now to sell more N in N-P-K!

BEST N FOR YOUR N-P-K

Arcadian

NITROGEN

There are many reasons why it pays to use ARCADIAN® Nitrogen in the manufacture of your mixed fertilizers. Here are only a few:

You are served by the leading producer of the most complete line of nitrogen products on the market. You have many different nitrogen solutions from which to select those best suited to your ammoniation methods and equipment. You get formulation assistance and manufacturing advice from the best-qualified technical service staff in the industry. You benefit from millions of tons of nitrogen experience and the enterprising research that originated nitrogen solutions. You get many important bonus values when you make ARCADIAN Nitrogen the N in your N-P-K.

ARCADIAN

Nitrogen Products

NITRANA® Nitrogen Solutions
URANA® Nitrogen Solutions
U-A-S® Nitrogen Solutions
N-dure® Solution
A-N-L® Nitrogen Fertilizer
Ammonium Nitrate
UREA 45 Nitrogen Fertilizer
Sulphate of Ammonia
American Nitrate of Soda

Allied Chemical

NITROGEN DIVISION

40 Rector St., New York 6, N. Y.

was 349,784 tons (2.4 percent) lower than in 1956-57. In 1957-58, a cumulative increase of 213,141 tons (6.6 percent) of mixtures was shown for 23 areas and a decrease of 562,925 tons (4.9 percent) for 28 areas. Larger quantities were used in most of the States of the New England, West North Central, Mountain, and Pacific regions, while in the majority of the other areas their use was smaller than in the preceding year.

Table 4.—Principal grades of mixtures consumed in United States, year ended June 30, 1958, compared with consumption of previous year.

Grade	Consumption[1]		Proportion of total		Grade	Consumption[1]		Proportion of total	
	1957	1958	1957	1958		1957	1958	1957	1958
	Tons	Tons	Percent	Percent		Tons	Tons	Percent	Percent
0-9-27	13,848	12,853	0.10	0.09	6-8-8	278,438	239,274	1.94	1.69
0-10-20	77,023	76,963	.54	.54	6-8-12	16,979	14,516	.11	.11
0-10-30	47,908	51,339	.33	.37	6-9-12	24,767	21,908	.17	.15
0-12-12	13,573	11,431	.10	.08	6-10-4	89,016	76,780	.62	.55
0-12-36	10,546	13,557	.07	.09	6-12-6	34,330	35,630	.24	.25
0-14-14	162,169	186,776	1.12	1.33	6-12-12	371,569	389,039	2.57	2.76
0-15-30	20,002	24,228	.14	.17	6-18-6	14,414	25,361	.10	.18
0-20-20	304,514	285,711	2.12	2.02	6-24-12	105,127	144,589	.73	1.03
0-24-24	9,331	10,764	.06	.08	6-24-24	63,358	107,939	.44	.76
0-25-25	27,032	30,247	.19	.21	7-7-7	24,417	19,617	.17	.14
0-30-15	13,561	10,835	.09	.08	7-8-8	8,672	10,569	.06	.07
0-30-30	15,879	14,440	.11	.10	7-28-14	14,204	26,933	.10	.20
2-12-12	371,393	302,441	2.57	2.15	8-0-8	11,022	12,017	.08	.08
3-9-6	251,084	48,138	1.74	.34	8-0-24	17,869	20,463	.13	.15
3-9-9	528,959	500,107	3.67	3.54	8-4-8	41,763	53,300	.29	.37
3-9-12	26,998	28,229	.19	.20	8-4-12	6,990	13,314	.05	.10
3-9-18	61,932	63,982	.43	.45	8-8-4	15,536	11,706	.10	.08
3-9-27	75,262	67,528	.52	.48	8-8-8	221,474	205,192	1.54	1.46
3-12-6	108,552	89,117	.75	.63	8-12-12	59,701	68,877	.42	.48
3-12-12	908,575	708,604	6.31	5.03	8-16-16	166,068	191,186	1.16	1.36
3-18-9	36,428	29,246	.25	.20	8-24-0	10,220	21,890	.07	.15
3-18-18	0	14,551	0	.11	8-24-8	62,403	45,615	.43	.33
4-6-6	10,635	10,437	.07	.07	8-24-12	18,643	23,877	.13	.17
4-6-8	43,788	28,720	.31	.20	8-32-0	56,439	52,210	.39	.37
4-7-5	118,792	114,495	.82	.81	9-6-6	14,459	13,892	.10	.09
4-8-4	12,340	14,698	.09	.11	9-9-9	16,605	33,634	.12	.24
4-8-6	143,180	82,839	.99	.59	9-12-12	11,644	13,870	.08	.10
4-8-8	208,791	137,019	1.45	.97	10-0-10	21,182	17,547	.14	.12
4-8-10	87,176	84,934	.60	.60	10-6-4	59,507	78,079	.41	.56
4-8-12	74,057	113,281	.52	.80	10-10-5	26,279	23,061	.18	.16
4-9-3	52,208	49,950	.36	.36	10-10-10	689,131	701,970	4.79	4.98
4-10-6	105,956	86,319	.74	.61	10-20-0	53,834	47,466	.38	.33
4-10-7	362,433	306,541	2.52	2.17	10-20-5	5,451	11,912	.03	.09
4-10-10	17,075	21,440	.12	.15	10-20-10	140,494	165,234	.98	1.17
4-12-4	61,625	41,225	.43	.29	10-20-20	29,195	45,248	.20	.32
4-12-8	148,832	123,724	1.03	.88	12-0-10	16,846	16,385	.12	.11
4-12-12	949,433	1,021,630	6.59	7.24	12-0-12	7,711	11,219	.05	.08
4-16-8	22,371	26,168	.16	.19	12-6-6	13,164	23,024	.09	.17
4-16-16	527,812	469,477	3.66	3.32	12-12-12	611,110	690,322	4.24	4.89
5-6-8	10,264	12,472	.07	.09	12-24-12	29,958	31,862	.21	.22
5-7-5	22,311	19,751	.15	.14	13-13-13	44,801	47,658	.31	.34
5-10-5	604,630	535,745	4.19	3.80	14-0-14	54,770	53,046	.38	.37
5-10-10	1,407,706	1,479,466	9.78	10.48	14-14-14	45,114	43,390	.31	.31
5-10-15	150,218	206,112	1.04	1.46	15-0-15	9,756	11,492	.07	.08
5-10-30	4,109	10,080	.02	.07	15-5-5	2,186	12,786	.01	.09
5-20-10	73,446	85,592	.51	.60	15-10-10	4,953	12,089	.03	.09
5-20-20	787,324	818,501	5.46	5.81	15-15-0	19,351	20,709	.13	.14
6-4-6	20,022	17,922	.14	.12	15-15-15	27,695	29,953	.20	.22
6-4-8	59,255	54,872	.41	.39	16-8-8	6,287	10,983	.04	.07
6-6-6	95,018	92,844	.66	.66	16-48-0	15,342	19,571	.11	.14
6-6-8	37,781	37,136	.27	.26	17-7-0	21,061	14,541	.14	.11
6-6-12	12,033	21,233	.08	.15	20-0-20	9,729	10,275	.06	.07
6-6-18	9,832	13,443	.07	.10	20-20-0	7,003	12,264	.05	.09
6-8-6	130,846	115,721	.91	.82					

	1957	1958	1957	1958
Grades of 10,000 tons or more	13,306,316[2]	12,911,855[3]	92.35	91.50
Grades of 5,000 to 9,999 tons	356,835[4]	409,442[5]	2.48	2.90
Grades of 2,500 to 4,999 tons	207,242[5]	215,938[6]	1.44	1.53
Grades under 2,500 tons	218,949[7]	204,304[8]	1.52	1.44
Not reported by grade	317,969	369,801	2.21	2.63
Total[9]	14,407,311[10]	14,111,340[11]	100.00	100.00

[1]Grades consumed in amounts of 10,000 tons or more in year ended June 30, 1958 and their consumption in year ended June 30, 1957. [2] 104 grades. [3] 108 grades. [4] 49 grades. [5] 56 grades. [6] 62 grades. [7] 1,301 grades. [8] 1,359 grades. [9] Does not include the quantity of mixtures consumed in Alaska, Hawaii, or Puerto Rico. [10] 1,510 grades. [11] 1,585 grades.

N-P-K mixtures (table 1) represented 90.2 percent of the total tonnage of mixtures, while the other types (N-P, P-K, N-K) accounted for 2.4 percent, 5.7 percent, and 1.7 percent, respectively. The N-P-K type comprised more than 80 percent of the tonnage of mixtures in all regions except the Mountain and Pacific. In these regions, N-P-K mixtures represented 53.5 percent and 77.3 percent, respectively, while the N-P type represented 45.6 percent and 21.3 percent, respectively.

Excluding Hawaii and Puerto Rico, 108 grades of mixtures were each used in quantities of 10,000 tons or more. Only 107 of these are listed in table 4, as one grade was restricted. The 108 grades totaled 12,911,855 tons and accounted for 91.50 percent of the quantity of mixtures used in the designated areas. Other grades consumed in the same areas in individual amounts of 2,500 to 9,999 tons totaled 118 (625,380 tons, 4.43 percent), while those under 2,500 tons totaled 1,359 (204,304 tons, 1.44 percent). The balance (369,801 tons, 2.63 percent) represented mixtures not reported by grades.

Consumption of mixtures in Hawaii and Puerto Rico amounted to 241,683 tons in 145 grades. While many of the grades in Puerto Rico are similar to those used in other areas of the United States, most of those in Hawaii are designated in fractional numbers.

The 15 grades consumed in largest tonnages in 1957-58 in each of the regions are shown in table 5, together with the quantities for each State in the region. At least 11 of the grades in each area were among the 15 consumed in largest tonnages in the preceding year, but not always in the same relative order of tonnage. The principal grades in 1957-58 accounted for 50 percent or more of the total quantity of mixtures consumed in each of the States except California, Colorado, Florida, Kansas, Nebraska, North Dakota, Oregon, South Dakota, Washington, and Wyoming. In each of these States, except North Dakota, they represented 30 to 49 percent of the total.

The total tonnage of the 15 grades shown for the United States, excluding Hawaii and Puerto Rico, represented 61.3 percent of the tonnage of all mixtures. Nearly two-thirds

Table 5.—Mixtures consumed in States and regions, by grade, year ended June 30, 1958

State	Consumption of 15 principal grades in indicated region Tons															Other grades No.[1]	Other grades Tons[2]	Total Tons
New England																		
	8-12-12	10-10-10	5-10-10	8-16-16	6-9-12	0-20-20	0-15-30	8-9-10	5-8-7	6-3-6	7-7-7	5-10-5	8-12-16	6-10-4	11-12-14			
Maine	58,136	24,606	8,318	14,836	21,855	3,334	532	9,470	1,740	0	310	370	6,117	182	5,684	42	15,384	170,874
New Hampshire	1,059	3,006	2,290	5,378	0	206	1,338	0	630	0	535	211	0	249	0	22	967	15,869
Vermont	555	8,495	5,550	7,719	0	12,920	2,963	0	42	0	261	72	75	27	0	26	1,513	40,192
Massachusetts	1,329	12,647	15,174	5,993	15	394	1,501	0	3,543	1,093	3,140	2,515	0	3,186	0	29	17,363	67,893
Rhode Island	884	1,361	7,297	313	0	253	328	0	462	0	470	315	0	132	0	25	3,394	15,209
Connecticut	1,279	11,286	10,004	2,741	0	1,473	3,469	0	1,580	5,609	1,883	2,753	0	1,920	0	68	12,844	56,841
Total	**63,242**	**61,401**	**48,633**	**36,980**	**21,870**	**18,580**	**10,131**	**9,470**	**7,997**	**6,702**	**6,599**	**6,236**	**6,192**	**5,696**	**5,684**	**101**	**51,465**	**366,878**
Middle Atlantic																		
	5-10-10	5-10-5	10-10-10	8-16-16	3-12-6	0-20-20	6-12-12	6-12-6	10-6-4	3-12-12	2-12-12	4-8-12	10-20-20	5-10-15	4-12-12			
New York	143,726	109,569	72,751	63,979	1,569	17,313	15,334	26,091	16,215	2,385	2	1,557	7,737	9,327	186	92	63,932	551,673
New Jersey	99,781	21,961	8,435	1,845	629	2,395	4,104	1,640	4,112	1,032	130	401	5,528	861	53	67	39,730	192,637
Pennsylvania	267,205	20,009	60,173	35,957	41,845	34,685	10,097	1,128	3,613	11,913	6,050	7,111	6,411	1,899	13,476	111	54,747	576,319
Delaware	36,762	1,188	8,063	3,355	432	1,667	2,869	0	218	961	4,354	877	656	6,674	1,362	66	9,324	78,762
Dist. of Col.	76	1,428	12	0	1	1	0	0	641	2	4	6	0	0	0	25	836	3,007
Maryland	97,369	25,070	22,484	7,181	21,451	6,376	2,825	3	3,058	9,430	12,703	13,508	2,527	1,607	4,133	91	31,665	261,390
West Virginia	31,134	2,440	3,522	338	6,310	5,005	371	5	531	347	2,617	27	430	172	90	55	11,042	64,381
Total	**676,053**	**181,665**	**175,440**	**112,655**	**72,237**	**67,442**	**35,600**	**28,867**	**28,388**	**26,070**	**25,860**	**23,487**	**23,289**	**20,540**	**19,300**	**196**	**211,276**	**1,728,169**
South Atlantic																		
	4-12-12	5-10-10	3-9-9	2-12-12	4-8-8	4-7-5	5-10-5	8-8-8	6-6-6	6-8-6	4-8-12	4-10-6	4-8-10	4-8-6	10-10-10			
Virginia	12,838	157,838	45,350	126,659	0	0	62,298	6,692	0	12,191	0	0	7,148	0	40,722	28	137,417	609,153
North Carolina	23,666	387,273	271,323	129,778	0	0	312	33,397	0	49,660	54,010	255	56,120	0	14,906	18	179,771	1,200,471
South Carolina	95,026	27,857	129,099	0	64	0	33,946	6,669	0	3,933	33,816	85,917	0	0	1,529	29	107,543	525,399
Georgia	633,004	6,424	46,970	11,848	56,237	0	3,240	5,352	94	19,637	0	28	0	52,203	793	114	148,801	984,631
Florida	46,229	3,633	6,170	4,822	73,844	114,495	2,383	42,778	91,905	4,471	1,560	105	21,477	30,587	8,543	997	843,263	1,294,265
Total	**810,763**	**583,025**	**498,912**	**273,107**	**130,145**	**114,495**	**102,179**	**94,888**	**91,999**	**89,892**	**89,386**	**86,305**	**84,745**	**82,790**	**66,493**	**1,036**	**1,416,795**	**4,615,919**
East North Central																		
	5-20-20	3-12-12	4-16-16	12-12-12	10-10-10	0-20-20	5-10-10	6-24-12	6-24-24	3-9-27	0-10-30	10-6-4	5-20-10	6-12-12	3-18-9			
Ohio	100,740	287,905	53,393	99,674	64,478	28,857	116,345	28,557	4,765	810	1,033	14,557	4,739	14,030	15,976	107	113,753	949,612
Indiana	192,311	71,573	182,032	132,876	51,514	38,074	2,970	11,999	19,397	15,967	11,249	2,697	1,351	4,561	3,174	141	108,691	850,436
Illinois	58,693	46,544	81,306	57,793	80,188	20,565	478	5,072	17,550	18,372	3,359	2,966	4,423	2,878	362	143	154,262	554,811
Michigan	124,293	94,505	88,544	86,165	25,637	10,487	2,893	30,368	2,226	2,636	2,976	14,823	19,535	6,459	8,707	102	55,796	576,050
Wisconsin	112,023	36,338	37,633	8,203	34,419	30,300	145	1,364	26,191	16,824	30,328	761	572	1,687	1,015	81	57,182	394,985
Total	**588,060**	**536,865**	**442,908**	**384,711**	**256,236**	**128,283**	**122,831**	**77,360**	**70,129**	**54,609**	**48,945**	**35,804**	**30,620**	**29,615**	**29,234**	**276**	**489,684**	**3,325,894**
West North Central																		
	12-12-12	5-20-20	6-24-12	10-10-10	5-20-10	8-24-8	3-12-12	0-20-20	10-20-0	8-24-12	8-32-0	4-16-16	8-8-8	6-24-24	4-12-4			
Minnesota	7,844	85,691	59,323	10,099	5,535	0	752	13,275	2,411	21,947	3,894	10,080	70	6,479	2	112	92,809	320,211
Iowa	25,386	96,072	5,065	35,321	45,214	398	7,415	9,634	11,813	283	10,370	5,765	26	5,815	17	223	81,003	339,597
Missouri	184,840	13,030	64	12,892	564	25,154	25,724	10,370	257	0	91	3,965	17,272	4,792	14,544	64	87,062	400,621
North Dakota	737	617	1,641	52	0	0	40	32	153	1,387	484	83	0	114	0	58	25,614	30,954
South Dakota	117	18	347	150	2	11	0	8	1,807	58	2,607	0	0	0	0	48	5,540	10,665
Nebraska	859	415	126	77	1,627	457	0	377	3,698	0	3,849	0	4	88	13	104	20,152	31,742
Kansas	3,249	292	0	1,533	0	13,513	323	416	9,062	0	1,129	3	204	54	2,002	58	37,175	68,955
Total	**223,032**	**196,135**	**66,566**	**60,124**	**52,942**	**39,533**	**34,254**	**34,112**	**29,201**	**23,675**	**22,424**	**19,896**	**17,576**	**17,342**	**16,578**	**302**	**349,355**	**1,202,745**

Table 5.—Mixtures consumed in States and regions, by grade, year ended June 30, 1958 — (Continued)

East South Central

	6-12-12	4-10-7	4-12-12	6-8-8	5-10-15	0-14-14	4-12-8	5-10-5	10-10-10	3-9-6	3-12-12	5-10-10	8-8-8	6-8-6	0-20-20			
Kentucky	28,414	0	745	0	103,276	497	85,286	2,346	36,758	10,373	32,176	14,995	413	21,910	8,162	113	90,243	435,594
Tennessee	255,806	313	1,058	1,607	20,970	281	5,982	3,643	4,204	35,720	6,278	10,147	1,567	439	4,345	99	57,653	410,013
Alabama	37	266,010	185,891	61,569	0	116,029	0	616	5,495	0	0	259	17,012	179	5,832	55	33,520	692,449
Mississippi	3,204	6,546	1,850	115,051	0	2,790	0	71,048	24	0	432	9,355	6,704	0	4,166	44	36,314	257,484
Total	**287,461**	**272,869**	**189,544**	**178,227**	**124,246**	**119,597**	**91,268**	**77,653**	**46,481**	**46,093**	**38,886**	**34,756**	**25,696**	**22,528**	**22,505**	**175**	**217,730**	**1,795,540**

West South Central

	5-10-5	10-20-10	12-12-12	8-8-8	12-24-12	6-24-24	13-13-13	3-12-12	5-20-20	6-8-12	10-20-0	6-8-8	0-20-20	5-10-10	4-12-4			
Arkansas	30,375	22,976	12,982	1,567	446	2,490	4,766	611	1,630	13,287	52	42	7,257	2,328	123	55	38,944	139,876
Louisiana	19,836	4,892	22,722	26,888	1,576	10,171	4,778	13,176	8,525	36	0	11,210	2,248	2,706	6,296	53	11,940	147,000
Oklahoma	16,144	18,580	644	198	1,790	763	253	202	510	0	5,439	0	89	765	649	60	12,200	58,226
Texas	81,668	88,951	6,361	11,592	18,968	1,800	4,930	552	2,973	1	6,903	118	74	3,114	954	125	57,366	286,325
Total	**148,023**	**135,399**	**42,709**	**40,245**	**22,780**	**15,224**	**14,727**	**14,541**	**13,638**	**13,324**	**12,394**	**11,370**	**9,668**	**8,913**	**8,022**	**180**	**120,450**	**631,427**

Mountain

	20-20-0	10-20-5	10-20-0	6-10-4	24-20-0	20-10-0	10-20-10	10-18-5	10-10-10	16-16-8	10-10-0	10-16-8	15-20-0	8-24-0	20-20-10			
Montana	1,068	0	1,321	166	259	298	13	281	0	136	0	0	0	67	0	17	835	4,444
Idaho	1,497	1	242	201	3,260	205	0	356	0	147	25	264	0	405	0	42	1,598	8,201
Wyoming	63	0	199	29	0	47	26	30	0	48	0	0	0	6	0	21	922	1,370
Colorado	420	0	392	986	0	184	163	1,160	309	471	0	1,107	0	0	1,040	65	7,411	13,643
New Mexico	574	93	137	5	0	0	106	0	40	108	79	0	0	344	0	37	1,232	2,718
Arizona	4,873	6,371	2,711	238	61	2,148	1,768	0	1,236	322	1,394	0	1,234	327	0	63	9,883	32,566
Utah	91	0	106	2,469	41	42	0	87	0	269	0	0	0	0	0	36	1,219	4,324
Nevada	195	0	203	395	0	156	0	0	94	79	0	0	0	0	0	25	762	1,884
Total	**8,781**	**6,465**	**5,311**	**4,489**	**3,621**	**3,080**	**2,076**	**1,914**	**1,679**	**1,580**	**1,498**	**1,371**	**1,234**	**1,149**	**1,040**	**166**	**23,862**	**69,150**

Pacific

	10-10-10	10-10-5	17-7-0	6-10-4	8-8-4	15-8-4	4-4-2	8-24-0	10-20-20	14-14-7	8-10-12	6-20-20	5-3-2	4-10-10	5-10-10			
Washington	750	119	0	2,687	0	0	0	4,618	3,638	0	0	2,297	2,268	0	3,136	125	25,612	45,125
Oregon	481	0	0	2,401	0	0	0	1,214	1,595	0	0	2,260	1,664	0	683	74	17,873	28,171
California	28,379	18,823	14,384	5,526	9,774	8,389	6,262	129	10	5,034	5,001	90	0	3,854	0	47[3]	196,667	302,322
Total	**29,610**	**18,942**	**14,384**	**10,614**	**9,774**	**8,389**	**6,262**	**5,961**	**5,243**	**5,034**	**5,001**	**4,647**	**3,932**	**3,854**	**3,819**	**140**	**240,152**	**375,618**

Other[4]

	14-4-10	15-4-7	14-2-8	10-10-8	8-6-10	6-8-10	10-6-20	13-3-12	12-3-16	12-4-10	12-6-10	12-10-5	9-10-5	12-6-8	16-4-5			
Puerto Rico	46,937	17,212	15,134	12,432	11,277	9,973	8,812	6,296	6,151	5,596	5,577	4,715	4,417	3,388	3,226	27	20,333	181,476

United States[5]

	5-10-10	4-12-12	5-20-20	3-12-12	10-10-10	12-12-12	5-10-5	3-9-9	4-16-16	6-12-12	4-10-7	2-12-12	0-20-20	6-8-8	5-10-15			
New England	48,633	0	0	67	61,401	5,383	6,236	0	0	2,001	0	0	18,580	4,298	6	107	220,273	366,878
Mid. Atlantic	676,053	19,300	652	26,070	175,440	17,254	181,665	310	574	35,600	0	25,860	67,442	84	20,540	197	481,325	1,728,169
So. Atlantic	583,025	810,763	518	57,914	66,493	3,167	102,179	498,912	887	19,639	33,672	273,107	4,271	45,168	50,776	1,036	2,065,428	4,615,919
E. No. Central	122,831	1,815	588,060	536,865	256,236	384,711	12,470	571	442,908	29,615	0	0	128,283	127	10,368	278	811,034	3,325,894
W. No. Central	1,435	70	196,135	34,254	60,124	223,032	6,600	0	19,896	10,685	0	0	34,112	0	3	306	616,399	1,202,745
E. So. Central	34,756	189,544	19,475	38,886	46,481	12,437	77,653	299	5,206	287,461	272,869	3,474	22,505	178,227	124,246	175	482,021	1,795,540
W. So. Central	8,913	112	13,638	14,541	4,506	42,709	148,023	10	6	3,918	0	0	9,668	11,370	105	182	373,908	631,427
Mountain	1	26	23	7	1,679	560	651	5	0	78	0	0	129	0	0	171	65,991	69,150
Pacific	3,819	0	0	0	29,610	1,069	268	0	0	42	0	0	721	0	68	148	340,021	375,618
Total	**1,479,466**	**1,021,630**	**818,501**	**708,604**	**701,970**	**690,322**	**535,745**	**500,107**	**469,477**	**389,039**	**306,541**	**302,441**	**285,711**	**239,274**	**206,112**	**1,570**	**5,456,400**	**14,111,340**

[1] Exclusive of mixtures not reported by grade. [2] Including the tonnage of mixtures not reported by grade. [3] Total number of mixtures exceeds 500 of which only 60 were reported by grade. [4] Total consumption in Hawaii was 60,207 tons of mixtures, comprising 104 grades, most of which were manufactured to consumers specifications. Total consumption in Alaska was estimated to be less than 200 tons of mixtures. [5] Exclusive of Alaska, Hawaii, and Puerto Rico.

of the tonnage was supplied by approximately one percent of the grades. As in the preceding year, the 5-10-10 grade was consumed in largest tonnage. The relative order of most of the other 14 grades was the same in 1957-58 as in 1956-57, except that the 3-9-6 grade was replaced by the 5-10-15 grade and the relative orders of the 5-20-20 and 3-12-12 grades and of the 4-10-7 and 2-12-12 grades were reversed.

The 5-10-10 and 4-12-12 grades, consumed in the largest tonnages for the individual grades have nutrient ratios of 1:2:2 and 1:3:3. Mixtures having these ratios were also used in the largest total tonnages in 1957-58 (table 6). The cumulative tonnages of all grades reported in the 10 listed ratios accounted for 74.1 percent of the total use of mixtures in the United States (excluding Hawaii and Puerto Rico) in 1957-58.

The national weighted average of the primary nutrients contained in mixtures in 1957-58 was 5.96 percent N, 12.53 percent available P_2O_5 and 11.73 percent K_2O, a total of 30.22 percent (table 7). The corresponding values in the preceding year were 5.74, 12.36, 11.43 (revised), and 29.53 (revised) percent. The proportionate increase was highest for N (3.83 percent), while that for available P_2O_5 was only 1.38 percent, and for K_2O 2.62 percent.

Compared with 1956-57, the average nitrogen content of all mixtures increased in each of 46 areas and decreased in 5. Available P_2O_5 increased or did not change in 32 areas and decreased in 19, while K_2O increased in 29 areas and decreased in 22. In 1957-58, the change to higher concentrations of primary nutrients in mixtures was largest for nitrogen in Hawaii and the New England, and West North Central regions and smallest in the Mountain and East South Central regions. For available P_2O_5 the change was largest in Hawaii, Puerto Rico, and the Pacific region, and smallest in the South Atlantic and East South Central regions. For K_2O the change was largest in the Mountain and Pacific regions, and smallest in the New England and East North Central regions. The only regions in which the average concentrations of primary nutrients were below that of the preceding year were the West North Central (revised average, 18.76 percent) and West South Central for available P_2O_5 and in the West North Central for K_2O. The concentration of P_2O_5 was also lower in Hawaii and Puerto Rico.

Materials

In 1957-58, the total consumption of materials for direct application, including secondary and trace nutrient materials, amounted to 8,162,740 tons—36.3 percent of all fertilizers used, compared with 35.3 percent for the preceding year. The quantity of these materials was 156,536 tons (2.0 percent) more than that (8,006,204 tons) in 1956-57. The tonnages of the principal grades and products in 1957-58 are shown in tables 1 and 8, and the changes from the preceding year are summarized in table 9.

Compared with the previous year, the chemical nitrogen materials and the natural organic materials were consumed in larger amounts, while the use of phosphate, potash, and secondary and trace nutrient materials decreased. The changes in consumption of chemical nitrogen, natural organic, and phosphate materials followed the general patterns of the past 5 years. The decreased consumption of potash materials was a reversal of the pattern.

The increase in the consumption of chemical nitrogen materials was due largely to greater use of anhydrous ammonia, nitrogen solutions, and ammonium sulfate. The larger tonnages of these materials together with increases in ammonium nitrate and other chemical nitrogen products, more than offset the decreased tonnages of ammonium nitrate-limestone mixtures, sodium nitrate, and urea. Compared with 1956-57, the changes in the areal use of anhydrous ammonia ranged from a decrease of 14.6 percent in Puerto Rico to an increase of 65.4 percent in the East North Central region. The percentage increases in this region, the West North Central (43.5 percent), West South Central (32.2 percent), and Mountain (30.4 percent) regions were all above the national increase of 28.9 percent. The total consumption of nitrogen solutions and aqua ammonia was 9.9 percent higher in 1957-58; the increase was only 4.4 percent in the Pacific region, the area of greatest use, but more than 50 percent in the New England, East North Central, West North Central, and West South Central regions. On the other hand, the use of such materials decreased greatly in Hawaii, owing to labor troubles on the sugar plantations.

The change in consumption of ammonium sulfate ranged from a decrease of 34.2 percent in Hawaii to an increase of 111.8 percent in the East South Central region; total use was 11.8 percent higher than for the preceding year. While these extremes were in areas using relatively small tonnages, the regions of principal consumption showed increases of 5.4 (East North Central), 8.8 (Pacific), 12.4 (Mountain), and 29.2 percent (West South Central). The total uses of ammonium nitrate-limestone mixtures and sodium nitrate decreased 12.3 percent and 11.7 percent, respectively, in 1957-58. These decreases were mostly in the South Atlantic and East South Central regions, the areas of principal use, in which the total tonnages of fertilizers have generally decreased over the past several years. The use of urea decreased 9.7 percent and

Table 6. — Ratios of primary nutrients of mixtures consumed in largest tonnage in United States, year ended June 30, 1958, compared with consumption of previous year.*

Nutrient ratio†	Consumption		Proportion of quantity of all mixtures	
	1957	1958	1957	1958
	Tons	Tons	Percent	Percent
1:2:2	2,185,187	2,245,038	15.2	15.9
1:4:4	2,287,069	2,104,639	15.8	14.9
1:1:1	1,783,217	1,868,314	12.4	13.2
1:3:3	1,490,491	1,535,657	10.3	10.9
1:2:1	836,800	800,611	5.8	5.7
0:1:1	542,682	546,498	3.8	3.9
1:4:2	326,880	381,942	2.3	2.7
1:2:3	233,578	331,163	1.6	2.4
1:6:6	371,395	316,992	2.6	2.3
4:10:7	362,853	306,711	2.5	2.2
Total	**10,420,152**	**10,437,565**	**72.3**	**74.1**

* Excluding Alaska, Hawaii, and Puerto Rico.

† N:available P_2O_5:K_2O.

Table 7.—Primary plant nutrient content of mixtures and of materials, as a weighted average, by States and regions, year ended June 30, 1958[1]

Percent

State and region	Mixtures[2] N	Mixtures[2] Available P_2O_5	Mixtures[2] K_2O	Mixtures[2] Total	Materials, Single nutrient[3] N	Materials, Single nutrient[3] Available P_2O_5[4]	Materials, Single nutrient[3] K_2O	Materials, Multiple nutrient[2]	Materials, Total nutrients	Total in mixtures and materials
Maine	8.16	11.98	12.88	33.02	29.76	20.60	51.31	9.55	22.26	32.54
New Hampshire	6.88	12.90	13.92	33.70	28.50	20.37	55.19	10.87	22.17	31.29
Vermont	4.80	15.32	16.44	36.56	33.64	19.93	56.55	11.16	21.59	32.05
Massachusetts	7.26	10.65	9.89	27.80	17.30	19.35	59.55	11.05	15.68	25.14
Rhode Island	6.29	10.45	10.39	27.13	20.17	18.78	58.98	9.43	14.83	25.65
Connecticut	6.74	10.32	10.72	27.78	27.22	21.94	59.44	12.72	19.16	25.53
New England	**7.27**	**11.82**	**12.32**	**31.41**	**23.97**	**20.33**	**57.85**	**11.69**	**19.22**	**29.44**
New York	6.60	12.04	10.36	29.00	27.90	20.37	52.10	10.16	22.85	28.19
New Jersey	5.71	10.92	10.61	27.24	24.75	19.07	43.18	13.06	21.00	26.59
Pennsylvania	5.33	12.43	11.68	29.44	29.97	20.08	52.49	13.15	23.29	28.83
Delaware	5.25	11.55	12.32	29.12	30.75	18.10	56.82	10.78	28.55	29.09
District of Columbia	7.42	9.44	5.35	22.21	18.33	20.60	60.75	9.62	10.87	19.39
Maryland	4.85	11.26	10.45	26.56	30.51	17.63	51.86	11.93	25.55	26.50
West Virginia	4.59	12.24	10.63	27.46	23.72	22.28	59.16	9.13	22.72	26.86
Middle Atlantic	**5.68**	**11.91**	**10.93**	**28.52**	**28.22**	**20.15**	**51.21**	**11.74**	**23.03**	**27.95**
Virginia	4.33	11.24	11.37	26.94	23.79	24.11	17.30	40.71	23.05	26.47
North Carolina	4.51	9.47	10.58	24.56	24.65	18.87	36.38	15.66	25.05	24.65
South Carolina	4.13	10.07	10.20	24.40	21.03	15.23	59.18	14.92	23.55	24.17
Georgia	4.43	10.76	11.46	26.65	28.24	14.45	57.45	20.15	27.45	26.81
Florida	6.00	6.75	9.01	21.76	23.43	15.77	50.86	18.77	22.03	21.80
South Atlantic	**4.84**	**9.29**	**10.39**	**24.52**	**24.56**	**16.69**	**40.51**	**20.00**	**24.64**	**24.54**
Ohio	5.65	14.45	13.28	33.38	33.11	21.80	57.45	22.73	30.86	33.13
Indiana	6.11	16.90	15.88	38.89	39.65	21.91	59.64	44.86	42.82	39.74
Illinois	6.78	15.20	14.36	36.34	35.33	8.18	61.77	24.22	19.26	25.78
Michigan	5.98	16.08	15.06	37.12	37.87	18.87	53.09	14.82	30.66	36.41
Wisconsin	4.43	16.32	20.28	41.03	49.01	27.70	57.53	12.01	39.73	40.90
East North Central	**5.87**	**15.71**	**15.26**	**36.84**	**37.14**	**10.00**	**60.16**	**21.97**	**25.48**	**33.56**
Minnesota	6.01	21.64	14.88	42.53	54.15	43.18	60.50	46.03	49.93	44.59
Iowa	6.88	18.71	12.84	38.43	43.19	32.30	59.88	34.86	39.38	38.79
Missouri	9.57	14.18	12.36	36.11	43.00	6.13	60.80	22.95	20.18	28.63
North Dakota	13.06	28.45	5.40	46.91	43.26	45.28	60.51	49.44	48.24	47.85
South Dakota	13.28	22.91	1.35	37.54	41.14	45.43	59.09	43.08	42.95	41.26
Nebraska	10.77	22.96	4.09	37.82	53.07	42.94	44.26	47.19	51.67	49.78
Kansas	11.32	24.01	5.00	40.33	40.42	43.92	60.40	41.02	41.47	41.07
West North Central	**8.12**	**18.69**	**12.25**	**39.06**	**47.26**	**20.94**	**60.26**	**43.48**	**37.54**	**38.33**
Kentucky	5.22	11.94	12.23	29.39	35.63	22.46	53.83	38.91	33.03	30.05
Tennessee	5.56	11.88	11.35	28.79	31.85	30.03	40.56	43.29	33.37	29.70
Alabama	3.62	11.21	10.37	25.20	25.80	13.46	59.47	48.70	24.18	24.92
Mississippi	6.08	9.89	8.20	24.17	37.92	12.30	59.87	43.44	30.89	28.15
East South Central	**4.80**	**11.35**	**10.73**	**26.88**	**32.88**	**15.79**	**51.97**	**44.28**	**29.40**	**27.68**
Arkansas	6.59	14.84	13.61	35.04	38.57	37.65	60.18	38.10	41.85	38.57
Louisiana	7.03	13.63	11.55	32.21	40.60	16.38	54.80	33.69	37.73	34.79
Oklahoma	8.15	18.20	7.37	33.72	37.83	26.23	55.82	39.23	31.62	32.76
Texas	8.53	16.19	8.01	32.73	48.75	27.13	46.93	38.51	42.55	38.31
West South Central	**7.72**	**15.48**	**10.01**	**33.21**	**44.05**	**26.72**	**58.05**	**38.39**	**40.76**	**37.19**
Montana	13.95	20.97	1.35	36.27	42.94	44.56	58.18	47.21	44.72	43.72
Idaho	18.10	19.70	2.41	40.21	31.78	43.73	61.79	39.02	35.92	36.26
Wyoming	13.65	20.95	2.04	36.64	42.16	44.47	60.50	69.49	46.60	45.54
Colorado	12.76	19.28	8.07	40.11	39.99	47.29	57.78	53.80	43.86	43.21
New Mexico	12.25	20.75	4.38	37.38	46.66	36.38	48.99	38.62	41.14	40.89
Arizona	13.46	18.22	3.89	35.57	37.30	34.59	54.02	39.55	37.75	37.37
Utah	8.60	14.52	4.72	27.84	34.04	40.86	60.67	44.59	37.54	36.47
Nevada	12.37	12.74	3.18	28.29	31.41	45.02	57.76	33.67	35.54	33.18
Mountain	**13.53**	**18.56**	**4.39**	**36.48**	**37.00**	**42.10**	**57.43**	**41.98**	**39.29**	**38.90**
Washington	9.46	14.75	8.94	33.15	39.27	33.97	55.74	35.23	38.58	37.56
Oregon	9.99	16.32	8.67	34.98	28.83	23.28	59.58	37.79	30.41	31.13
California	10.99	11.49	6:57	29.05	30.36	28.02	54.03	12.83	23.92	25.01
Pacific	**10.74**	**12.24**	**7.01**	**29.99**	**31.64**	**28.44**	**55.33**	**15.65**	**26.53**	**27.24**
Average for 48 States & D. C.	**5.85**	**12.65**	**11.72**	**30.22**	**34.69**	**17.94**	**55.60**	**25.38**	**30.15**	**30.20**
Hawaii	12.55	5.66	18.51	36.72	25.58	19.79	58.88	62.19	31.69	34.22
Puerto Rico	11.96	5.44	10.26	27.66	22.23	22.31	53.13	75.60	22.44	26.48
United States: 1957-58	5.96	12.53	11.73	30.22	34.43	17.95	55.67	25.48	30.11	30.18
1956-57	5.74	12.36	11.43[5]	29.53[5]	32.62	17.92	55.20	24.14	28.81	29.30
1955-56	5.39	12.08	11.20	28.67	32.36	16.55	55.64	22.71	27.44	28.29

[1] Excluding fertilizers not guaranteed to contain one or more of the primary plant nutrients, N, P_2O_5, or K_2O. [2] Guaranteed to contain two or more of the primary plant nutrients. [3] Guaranteed to contain one of the primary plant nutrients. [4] Including 2 percent of the colloidal phosphate and 3 percent of the phosphate rock marketed for direct application. [5] Revised.

Table 8.—Materials for direct application consumed in States and regions, by class and by product, year ended June 30, 1958[1]

Tons

State and region	Chemical nitrogen materials: Ammonia (anhydrous)	Ammonium nitrate	Ammonium nitrate-limestone mixtures	Ammonium sulfate	Calcium cyanamide	Nitrogen solutions and aqua ammonia[2]	Sodium nitrate	Urea	Other[2]	Natural organics[2]	Phosphate materials[2]: Phosphate rock[3]	Superphosphates: Grades 22 percent and under	Superphosphates: Grades over 22 percent	Other	Potash materials: Chlorides 50-62 percent grades	Other[2]	Total: Primary nutrient materials	Secondary and trace nutrient materials[2]
Maine	0	1,030	1	80	248	224	144	117	29	875	3	4,938	1	88	146	45	7,969	25
New Hampshire	0	538	13	1	136	222	71	49	11	858	10	2,022	10	61	141	42	4,185	8
Vermont	0	1,020	29	4	3	142	22	159	8	199	43	15,367	0	35	311	2	17,344	13
Massachusetts	0	1,250	103	383	292	10	769	138	71	11,495	158	3,036	10	748	537	6	19,006	84
Rhode Island	0	102	5	1	144	0	63	73	36	1,343	12	185	0	67	38	1	2,070	29
Connecticut	0	840	11	62	556	306	513	540	81	10,325	48	4,739	90	726	657	582	20,076	30
New England	**0**	**4,780**	**162**	**531**	**1,379**	**904**	**1,582**	**1,076**	**236**	**25,095**	**274**	**30,287**	**111**	**1,725**	**1,830**	**678**	**70,650**	**189**
New York	848	15,215	761	272	4,105	1,177	3,643	1,301	825	17,009	757	32,784	544	888	1,758	1,296	83,183	742
New Jersey	362	2,438	265	387	1,621	253	2,201	601	775	7,462	227	3,309	25	1,840	661	432	22,859	81
Pennsylvania	696	10,376	129	3,491	1,287	578	1,493	799	501	9,676	4,706	23,904	1,941	1,735	1,495	839	63,646	2,354
Delaware	50	709	292	1	527	652	154	106	2	254	200	296	0	87	158	18	3,506	170
District of Columbia	0	11	0	2	0	0	14	15	14	878	0	10	0	49	1	0	994	0
Maryland	529	2,061	713	39	1,482	1,032	1,596	800	85	1,615	1,591	3,175	8	613	589	190	16,118	590
West Virginia	0	1,006	35	307	11	0	1,206	39	14	510	91	5,490	407	60	182	9	9,367	2
Middle Atlantic	**2,485**	**31,816**	**2,195**	**4,499**	**9,033**	**3,692**	**10,307**	**3,661**	**2,216**	**37,404**	**7,572**	**68,968**	**2,925**	**5,272**	**4,844**	**2,784**	**199,673**	**3,939**
Virginia	737	7,608	18,289	1,368	978	8,598	14,618	221	280	918	1,513	6,443	304	3,025	3,118	13,479	81,497	14,787
North Carolina	7,895	15,712	100,453	204	4,035	33,845	65,584	475	1	2,923	525	12,776	36	4,577	9,671	10,938	269,650	40,691
South Carolina	1,699	19,803	61,303	323	1,206	21,469	63,209	87	809	1,263	320	10,642	89	5,584	14,614	1,507	203,927	3,426
Georgia	11,650	73,915	37,923	3,746	817	13,908	56,970	185	183	2,004	4,417	13,392	86	9,306	6,008	1,399	235,909	37,761
Florida	3,194	19,331	5,976	6,032	1,822	6,774	41,433	2,846	9,717	14,771	11,746	7,176	5,190	4,614	2,195	17,134	159,951	5,019
South Atlantic	**25,175**	**136,369**	**223,944**	**11,673**	**8,858**	**84,594**	**241,814**	**3,814**	**10,990**	**21,879**	**18,521**	**50,429**	**5,705**	**27,106**	**35,606**	**44,457**	**950,934**	**101,674**
Ohio	3,983	21,508	2	15,544	456	5,295	645	1,942	1,054	8,460	7,911	15,777	5,939	4,410	8,789	943	102,658	332
Indiana	18,555	44,497	1,403	14,158	365	25,377	121	6,010	375	2,262	20,596	4,900	16,042	4,979	68,540	3,439	231,619	128
Illinois	25,386	51,412	366	63,914	81	20,422	79	1,360	374	12,599	530,886	27,800	51,694	14,080	97,413	101	897,967	1,000
Michigan	4,104	14,974	254	2,666	119	5,846	537	2,484	808	14,513	3,851	8,745	1,674	2,360	6,416	2,632	71,983	927
Wisconsin	5,123	5,707	0	826	7	4,694	0	154	309	8,810	3,122	1,844	1,332	2,305	10,219	889	45,341	146
East North Central	**57,151**	**138,098**	**2,025**	**97,108**	**1,028**	**61,634**	**1,382**	**11,950**	**2,920**	**46,644**	**566,366**	**59,066**	**76,681**	**28,134**	**191,377**	**8,004**	**1,349,568**	**2,533**
Minnesota	19,573	15,433	105	387	0	14,551	0	444	121	4,158	1,322	4,950	25,691	24,249	12,044	3	123,031	64
Iowa	18,114	49,526	21	3,900	0	19,108	0	591	176	5,359	6,989	32,182	31,738	20,773	13,865	75	202,417	78
Missouri	21,508	65,056	0	4,425	188	12,996	286	224	96	4,982	209,047	1,793	8,963	7,506	18,195	80	355,345	147
North Dakota	555	2,071	0	32	0	43	0	40	10	68	0	13	17,758	55,196	2	0	75,788	0
South Dakota	1,374	5,941	0	80	0	1,002	0	105	79	340	40	195	5,259	9,140	22	0	23,577	1
Nebraska	68,517	52,492	0	1,827	0	43,262	0	1,668	83	1,026	754	1,634	17,948	10,554	271	199	200,235	76
Kansas	9,441	52,521	47	1,120	1	1,112	0	724	35	753	176	782	25,449	35,310	995	0	128,466	126
West North Central	**139,082**	**243,040**	**173**	**11,771**	**189**	**92,074**	**286**	**3,796**	**600**	**16,686**	**218,328**	**41,549**	**132,806**	**162,728**	**45,394**	**357**	**1,108,859**	**492**
Kentucky	3,137	32,838	498	1,003	1,356	1,631	1,657	169	25	522	11,371	19,745	1,224	6,927	7,973	6,169	96,245	131
Tennessee	5,440	33,839	1,040	452	1,771	120	19,057	22	7	1,013	1,192	7,855	3,185	9,450	10,476	8,122	103,041	431
Alabama	4,222	73,331	24,536	10,013	217	742	67,994	12	12	670	1,496	23,238	369	37,110	8,551	196	252,709	2,028
Mississippi	39,033	144,069	4,723	454	6,298	6,973	41,260	1,009	139	35	2,558	24,729	1,433	87,083	14,282	597	374,675	55
East South Central	**51,832**	**284,077**	**30,797**	**11,922**	**9,642**	**9,466**	**129,968**	**1,212**	**183**	**2,240**	**16,617**	**75,567**	**6,211**	**140,570**	**41,282**	**15,084**	**826,670**	**2,645**
Arkansas	21,373	41,737	3	4,004	4,692	7,634	25,404	7,322	2	65	207	4,439	8,717	1,633	23,407	91	150,730	2
Louisiana	27,132	33,130	321	11,346	1,180	9,220	21,585	1,426	475	448	4,533	6,080	2,266	6,569	2,851	466	129,028	63
Oklahoma	1,464	6,007	20	1,518	0	258	572	295	7	1,413	2,967	17,161	7,868	8,645	459	49	48,702	0
Texas	89,958	25,268	190	80,910	595	13,418	1,596	9,657	120	6,431	11,622	31,028	24,079	78,146	2,193	1,246	376,457	5,010
West South Central	**139,927**	**106,142**	**534**	**97,778**	**6,467**	**30,530**	**49,157**	**18,700**	**604**	**8,357**	**19,329**	**58,708**	**42,930**	**94,993**	**28,909**	**1,852**	**704,917**	**5,075**
Montana	1,574	4,127	1	483	0	666	0	109	21	240	0	0	18,746	7,305	41	14	33,327	443
Idaho	6,142	17,912	1	17,371	238	14,593	30	401	171	534	120	661	19,977	14,110	952	40	93,253	6,579
Wyoming	1,003	3,350	0	632	0	4	0	525	10	18	0	50	4,047	1,859	6	0	11,504	0
Colorado	5,896	23,583	341	4,062	75	1,747	0	2,099	357	1,485	40	167	14,122	10,549	388	126	65,037	2,909
New Mexico	4,688	2,608	49	3,801	0	1,555	0	2,761	6	1,285	0	5,724	8,549	6,001	77	72	37,176	42
Arizona	21,201	8,295	3,227	30,168	859	13,343	422	12,691	11,900	3,352	40	6,648	3,063	39,670	100	907	155,886	20,484
Utah	2,088	10,090	2	6,108	1	246	0	388	459	476	0	2,395	8,397	4,389	54	0	35,093	292
Nevada	162	307	1	545	0	451	41	60	12	252	0	0	838	1,224	14	7	3,914	15,961
Mountain	**42,754**	**70,272**	**3,622**	**63,170**	**1,173**	**32,605**	**493**	**19,034**	**12,936**	**7,642**	**200**	**15,645**	**77,739**	**85,107**	**1,632**	**1,166**	**435,190**	**46,710**
Washington	36,926	30,475	10	13,243	230	60,866	120	975	2,628	4,527	920	5,772	7,221	26,614	2,929	1,124	194,580	8,034
Oregon	7,901	25,923	7	37,226	913	35,246	5	3,701	2,423	814	331	7,615	1,450	25,236	1,689	154	150,634	13,339
California	79,429	45,916	43	175,535	7,436	249,910	261	22,368	30,717	321,854[4]	283	58,537	18,857	100,104	1,411	5,977	1,118,638	752,602
Pacific	**124,256**	**102,314**	**60**	**226,004**	**8,579**	**346,022**	**386**	**27,044**	**35,768**	**327,195**	**1,534**	**71,924**	**27,528**	**151,954**	**6,029**	**7,255**	**1,463,852**	**773,975**
Total	**582,662**	**1,116,908**	**263,512**	**524,456**	**46,348**	**661,521**	**435,375**	**90,287**	**66,453**	**493,142**	**848,741**	**472,143**	**372,636**	**697,589**	**356,903**	**81,637**	**7,110,313**	**937,232**
Hawaii	0	0	0	6,522	0	24,372	133	7,791	111	110	2,804	4,192	1,610	2,447	7,798	1,865	59,755	2,496
Puerto Rico	772	0	0	46,133	0	3,715	1	305	0	0	0	1,555	117	11	89	246	52,944	0
United States: 1957-58	583,434	1,116,908	263,512	577,111	46,348	689,608	435,509	98,383	66,564	493,252	851,545	477,890	374,363	700,047	364,790	83,748	7,223,012	939,728
1956-57	452,702	1,105,196	300,586	516,183	46,978	627,310	493,159	108,916	55,398	479,671	836,183	559,998	373,969	645,813	376,169	84,730	7,062,961	943,243
1955-56	419,354	940,666	313,928	414,398	65,818	418,843	542,804	92,373	64,668	472,706	930,914	607,026	325,723	614,652	322,411	82,428	6,628,712	789,605

[1] Excluding lime and the quantities used for manufacture of commercial mixtures. [2] The principal kinds are shown separately in table 1, by regions. [3] Including colloidal phosphate, the quantity of which is shown separately in table 1, by regions. [4] Including an estimated 260,000 tons of dried manures.

was generally lower in most of the tabulated areas.

Consumption of the principal natural organic products (composts, dried manures, sewage sludges) was only a little higher in 1957-58, while the use of most of the other products in this category was generally lower than in the preceding year.

The total consumption of phosphate materials decreased 12,118 tons (0.5 percent) from that in 1956-57. The principal change was in the use of colloidal phosphate and phosphate rock, an increase of 15,362 tons (1.8 percent). The use of superphosphates (22 percent grades and under) decreased 82,108 tons (14.7 percent); the consumption in each of 41 areas was lower than in 1956-57. Although the use of grades of superphosphate containing over 22 percent P_2O_5 was lower in 27 areas, the increases in the other areas were sufficient to give a slightly higher net total (394 tons, 0.1 percent).

Among the other phosphate materials, the 11-48, 16-20, 27-14, and 21-53 grades of ammoniated phosphates (table 10) were the principal products consumed in increased amounts. The tonnages of these materials were notably higher in most States of the West North Central, West South Central, Mountain, and Pacific regions, where they are principally used. The total use of 13-39 grade was 180 tons (0.4 percent) lower than in 1956-57; although there were increases in many areas, the decreased use in most of the West South Central States resulted in a slightly lower total use. The consumption of basic slag, which finds its greatest use in the South Atlantic and East South Central regions, was lower by 18,440 tons (11.3 percent).

The total consumption of potash materials in 1957-58 was lower than in 1956-57 by 12,361 tons (2.7 percent). This is the first time in many years that the total tonnage of these products has not shown an annual increase. The use of the 50-62 percent grades of potassium chloride, which comprised 81.3 percent of the total consumption of potash materials, decreased 11,379 tons (3.0 percent). The decreases were principally in the East South Central, West South Central, and South Atlantic regions and in Hawaii. Consumption increased in four regions, and there was only a slight change elsewhere. The use of lime-potash mixtures and manure salts decreased while increases were shown for potassium-magnesium sulfate (28 percent), potassium-sodium nitrate (58 percent), and potassium sulfate (2 percent).

Table 9.—Consumption of classes of materials in United States, years ended June 30, 1957 and 1958, with comparisons

Class	Consumption 1957	Consumption 1958	Change in consumption	
	Tons	Tons	Tons	Percent
Chemical nitrogen materials	3,706,428	3,877,377	170,949	4.6
Natural organic materials	479,671	493,252	13,581	2.8
Phosphate materials	2,415,963	2,403,845	—12,118	— .5
Potash materials	460,899	448,538	—12,361	—2.7
Secondary & Trace nutrient materials	943,243	939,728	— 3,515	— .4
Total	**8,006,204**	**8,162,740**	**156,536**	**2.0**

The quantities of most of the secondary and trace nutrient materials were lower in 1957-58 than in 1956-57. The use of gypsum (888,702 tons) comprising 95 percent of the total tonnage of such materials decreased only 0.3 percent.

The weighted average primary nutrient contents of the direct application materials used in each of the areas are shown in table 7. These averages are computed from the compositions and tonnages of the individual materials. In 1957-58, the national averages of materials containing only N, P_2O_5, or K_2O, were 34.43, 17.95 (available P_2O_5), and 55.67 percent, respectively; for multiple-nutrient materials the average was 25.48 percent, for all materials 30.11 percent. The corresponding averages in 1956-57 were 32.62, 17.92, 55.20, 24.14, and 28.81 percent. The higher national averages in 1957-58 reflect generally the greater use of the higher analysis products. The increase in the nitrogen average was due principally to the larger tonnages of anhydrous ammonia and nitrogen solutions. The averages for materials containing only P_2O_5 or K_2O showed little change from those in 1956-57. The increase in the average for the multiple-nutrient materials was principally due to the increased use of ammoniated phosphates and activated sewage sludge, while the tonnages of the lower grade products (dried manures, etc.) did not change appreciably.

Primary Plant Nutrients

The fertilizers used in 1957-58 contained a total of 6,512,387 tons of N, available P_2O_5, and K_2O. The quantities of these nutrients consumed in each of the areas are shown in table 11, and the changes from the preceding year are given in table 12. The consumption of the nutrients was 135,185 tons (2.1 percent) more than that (6,377,202 tons, revised) in 1956-57. In 1957-58 the nutrients comprised 2,284,359 tons of N, 2,292,890 tons of available P_2O_5, and 1,935,138 tons of K_2O. Compared with the preceding year, nitrogen increased 149,072 tons (7.0 percent), but decreases occurred in available P_2O_5 (12,102 tons, 0.5 percent), and K_2O (1,785 tons, 0.1 percent). As shown in table 7, the national weighted average of primary nutrients in all fertilizers containing these nutrients was 30.18 percent in 1957-58 and 29.30 percent in the preceding year. Although the tonnage of fertilizers containing the nutrients in 1957-58 was 0.9 percent less than in 1956-57, the quantity of primary nutrients supplied was 2.1 percent more.

Mixtures comprised 66.5 percent of the total tonnage of primary nutrient fertilizers and supplied 37.4 percent of the N, 78.4 percent of the available P_2O_5, and 87.0 percent of the K_2O. Compared with 1956-57, mixtures supplied 1.4 and 0.2 percent more N and K_2O and 1.0 percent less available P_2O_5. While the tonnage of mixtures decreased 2.4 percent in 1957-58, the total content of N, available P_2O_5, and K_2O was only 0.1 percent lower. As shown in table 7, the national weighted average of primary nutrients in mixtures was 30.22 percent in 1957-58 and 29.53 percent (revised) in the preceding year.

Primary nutrient materials used for direct application comprised 33.5 percent of the total tonnage of fertilizers containing such nutrients; they accounted for 62.6 percent of the N, 21.6 percent of the available P_2O_5, and 13.0 percent of the K_2O. The quantities of N and available P_2O_5 supplied by direct application materials were, respectively, 10.6 and 1.4, percent higher, while that of K_2O was 1.8 percent lower, than

in the preceding year. Although the tonnage of materials containing these nutrients increased 2.3 percent in 1957-58, the total quantity of N, available P_2O_5, and K_2O supplied thereby, increased 6.9 percent. This is reflected in the national average of the total nutrient content of materials, shown in table 7, which was 30.11 percent in 1957-58 and 28.81 percent in the preceding year.

Although the national total of primary nutrients was higher in 1957-58 than in 1956-57, there were decreases in consumption of one or more of the nutrients, supplied by either mixtures or materials, in 46 of the 51 areas (table 12). In 12 areas, however, the increase in the quantity of a nutrient supplied by either a mixture or a material was sufficiently high to offset the decrease in that nutrient in the other category. In the other 34 areas the decrease in the nutrient in one category was not offset by an increase in the other category. Nitrogen decreased in 15 such areas, available P_2O_5 in 26, and K_2O in 23. Most were in the southeastern part of the country.

The national use of nitrogen increased 149,072 tons, of which 11,578 tons (7.8 percent) were supplied by mixtures and 137,494 tons (92.2 percent) by materials. The increase in nitrogen was largest in the West North Central region, followed by the East North Central and Pacific regions, while the largest decrease was in the East South Central region.

The national use of available P_2O_5 decreased 12,102 tons. The quantity in mixtures decreased 19,036 tons, while that in materials increased 6,934 tons. The decreased use in mixtures was largely in the South Atlantic and East South Central regions. While there were variations in the changes in the other areas, the principal increases for mixtures were in the East North Central and Pacific regions and for materials in the East and West North Central and the Mountain regions.

The national use of K_2O decreased 1,785 tons. The use in mixtures increased 2,789 tons while that in materials decreased 4,574 tons. The higher consumption of K_2O in mixtures chiefly in the South Atlantic, East North Central, and Pacific regions more than offset its lower use in other areas, notably the West North Central and East South Central regions and Puerto Rico. Its use in direct application materials was generally lower in the southeastern part of the country while only in the East North Central region were increases shown in all of the States.

The quantities of primary nutrients in the principal kinds of fertilizers used in 1957-58 are shown by regions in table 13. Seventy-seven percent of the national consumption of nitrogen was in four commodities—N-P-K mixtures, anhydrous ammonia, ammonium nitrate, and ammonium sulfate—which supplied, respectively; 34.2, 21.0, 16.5, and 5.3 percent. These four commodities accounted for 61 percent (Pacific) to 92 percent (Middle Atlantic) of the regional consumptions. In the Pa-

Table 10.—Ammoniated phosphates consumed in States and regions as direct-application materials, by grades, year ended June 30, 1958[1]

Tons

State and region	Grade[2] 11-48	13-39	16-20	27-14	21-53
New York	78	0	0	0	0
New Jersey	22	0	0	0	0
Pennsylvania	343	0	0	0	109
Maryland	11	0	0	0	4
Middle Atlantic	**454**	**0**	**0**	**0**	**113**
Virginia	40	0	0	0	999
North Carolina	0	0	0	0	181
South Carolina	0	0	0	0	75
Georgia	0	0	0	0	285
Florida[3]	5	0	0	0	1
South Atlantic	**45**	**0**	**0**	**0**	**1,541**
Ohio	2,031	0	194	0	638
Indiana	3,823	65	62	0	764
Illinois	2,388	134	680	0	1,777
Michigan	1,239	4	0	0	422
Wisconsin	147	17	12	0	195
East North Central	**9,628**	**220**	**948**	**0**	**3,796**
Minnesota	10,733	2,338	4,757	464	937
Iowa	1,918	2,708	9,257	831	602
Missouri	1,369	216	1,057	0	12
North Dakota	26,303	3,722	23,648	1,276	191
South Dakota	2,265	223	5,573	626	307
Nebraska	1,619	1,325	5,027	15	2,309
Kansas	818	7,840	25,316	0	1,144
West North Central	**45,025**	**18,372**	**74,635**	**3,212**	**5,502**
Kentucky	2	18	0	0	446
Tennessee	0	0	0	0	1,495
Alabama	0	0	0	0	1,263
Mississippi	9	6	73	0	252
East South Central	**11**	**24**	**73**	**0**	**3,456**
Arkansas	69	113	747	0	2
Louisiana	35	12	3,082	0	0
Oklahoma	517	3,206	4,753	0	116
Texas	2,918	11,604	58,735	0	2,909
West South Central	**3,539**	**14,935**	**67,317**	**0**	**3,027**
Montana	2,700	81	2,494	401	0
Idaho	785	375	9,693	2,750	40
Wyoming	93	38	145	16	1,173
Colorado	154	986	1,071	0	4,035
New Mexico	675	1,058	3,941	0	327
Arizona	3,133	3,074	27,127	645	2,199
Utah	1,575	23	1,660	414	24
Nevada	43	124	865	110	5
Mountain	**9,158**	**5,759**	**46,996**	**4,336**	**7,803**
Washington	1,894	653	14,486	7,616	259
Oregon	1,710	662	22,031	229	130
California[4]	10,507	4,851	68,268	2,290	684
Pacific	**14,111**	**6,166**	**104,785**	**10,135**	**1,073**
Hawaii	1,095	0	261	0	1,091
Puerto Rico	0	0	0	0	11
United States	**83,066**	**45,476**	**295,015**	**17,683**	**27,413**

[1] There was no consumption in States not listed. [2] Including the quantity of these grades reported as mixtures. [3] In addition, 37 tons of 4-16-0 grade ammoniated superphosphate was consumed. [4] In addition, 3,012 tons of 4-16-0 grade ammoniated superphosphate was consumed.

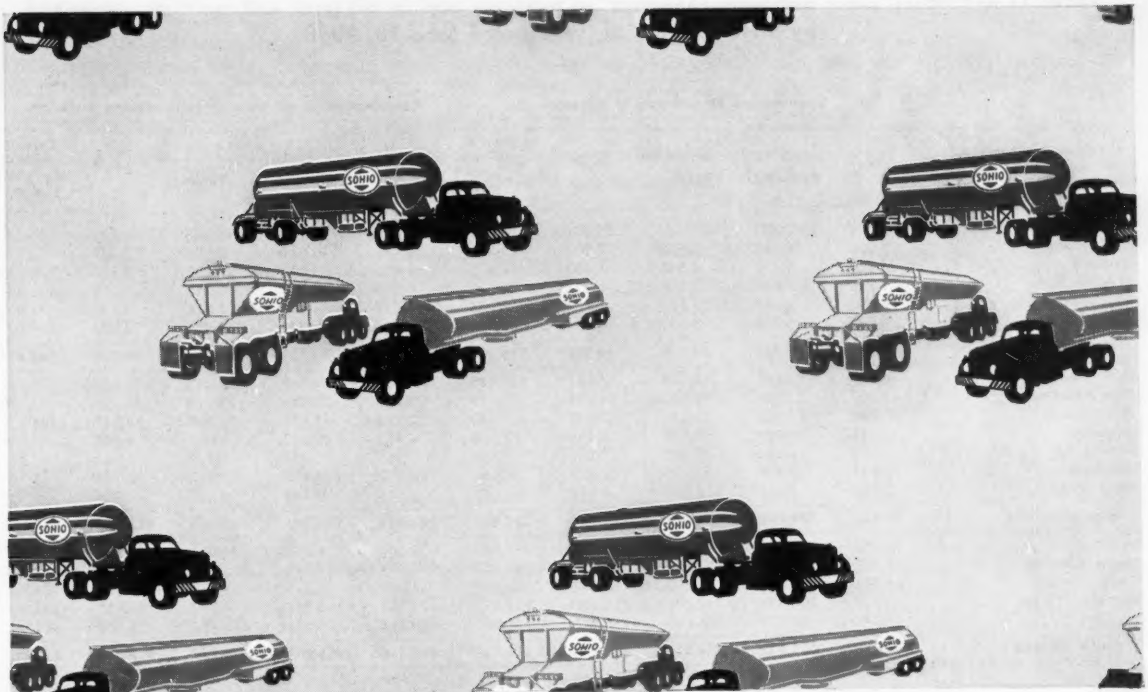

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Table 11.—Primary plant nutrients consumed in mixtures and in mixtures and materials combined, by State and region, year ended June 30, 1958

Tons

State and region	Consumption of nutrients in mixtures: N	Mixtures: P_2O_5 Available	Mixtures: P_2O_5 Total	Mixtures: K_2O	Mixtures: Total N, available P_2O_5 and K_2O	Consumption of nutrients in mixtures and materials: N	Mixtures and materials: P_2O_5 Available[1]	Mixtures and materials: P_2O_5 Total[2]	Mixtures and materials: K_2O	Mixtures and materials: Total N, available P_2O_5 and K_2O
Maine	13,936	20,472	21,142	22,010	56,418	14,533	21,534	22,235	22,125	58,192
New Hampshire	1,092	2,047	2,116	2,209	5,348	1,446	2,511	2,596	2,321	6,278
Vermont	1,931	6,157	6,346	6,607	14,695	2,409	9,243	9,529	6,787	18,439
Massachusetts	4,926	7,230	7,518	6,714	18,870	6,368	8,327	8,746	7,156	21,851
Rhode Island	957	1,589	1,657	1,580	4,126	1,137	1,675	1,714	1,621	4,433
Connecticut	3,829	5,868	6,151	6,094	15,791	5,343	7,431	7,815	6,864	19,638
New England	**26,671**	**43,363**	**44,930**	**45,214**	**115,248**	**31,236**	**50,721**	**52,635**	**46,874**	**128,831**
New York	36,427	66,417	68,939	57,134	159,978	46,085	74,049	77,055	58,850	178,984
New Jersey	11,007	21,044	21,695	20,448	52,499	13,930	22,345	23,113	21,025	57,300
Pennsylvania	30,746	71,633	74,325	67,335	169,714	37,274	78,618	82,887	68,647	184,539
Delaware	4,133	9,097	9,456	9,704	22,934	4,915	9,212	9,632	9,808	23,935
District of Columbia	223	284	302	161	668	276	329	347	171	776
Maryland	12,684	29,424	31,077	27,322	69,430	15,357	30,447	32,587	27,744	73,548
West Virginia	2,955	7,881	8,382	6,844	17,680	3,597	9,243	9,843	6,968	19,808
Middle Atlantic	**98,175**	**205,780**	**214,176**	**188,948**	**492,903**	**121,434**	**224,243**	**235,464**	**193,213**	**538,890**
Virginia	26,353	68,459	73,016	69,249	164,061	39,203	71,517	76,580	72,128	182,848
North Carolina	54,102	113,699	122,564	127,056	294,857	110,625	117,244	126,373	134,532	362,401
South Carolina	21,691	52,923	56,693	53,614	128,228	57,584	55,511	59,533	63,165	176,260
Georgia	43,648	106,002	112,079	112,823	262,473	100,170	110,126	117,710	116,924	327,220
Florida	77,841	87,529	106,663	116,833	282,203	103,766	92,494	115,170	121,183	317,443
South Atlantic	**223,635**	**428,612**	**471,015**	**479,575**	**1,131,822**	**411,348**	**446,892**	**495,366**	**507,932**	**1,366,172**
Ohio	53,656	137,188	143,523	126,110	316,954	71,184	145,674	154,664	131,784	348,642
Indiana	51,996	143,748	148,352	135,051	330,795	96,682	155,310	166,009	177,989	429,981
Illinois	37,597	84,352	88,012	79,689	201,638	96,672	137,830	294,287	140,090	374,592
Michigan	34,468	92,623	96,179	86,767	213,858	47,433	96,773	101,641	91,723	235,929
Wisconsin	17,488	64,477	67,321	80,107	162,072	26,193	67,289	71,107	86,604	180,086
East North Central	**195,205**	**522,388**	**543,387**	**507,724**	**1,225,317**	**338,164**	**602,876**	**787,708**	**628,190**	**1,569,230**
Minnesota	19,257	69,307	71,489	47,644	136,208	49,448	93,178	96,234	55,017	197,643
Iowa	23,357	63,548	66,231	43,609	130,514	65,391	92,835	98,230	52,002	210,228
Missouri	38,347	56,821	59,460	49,519	144,687	83,943	71,762	135,240	60,706	216,411
North Dakota	4,043	8,807	9,049	1,672	14,522	12,923	36,483	37,106	1,674	51,080
South Dakota	1,416	2,443	2,612	144	4,003	6,362	7,607	7,926	160	14,129
Nebraska	3,419	7,288	7,380	1,299	12,006	94,154	19,800	20,369	1,520	115,474
Kansas	7,803	16,555	17,038	3,445	27,803	39,497	37,524	38,638	4,053	81,074
West North Central	**97,642**	**224,769**	**233,259**	**147,332**	**469,743**	**351,718**	**359,189**	**433,743**	**175,132**	**886,039**
Kentucky	22,730	52,026	56,267	53,281	128,037	37,934	61,013	68,564	60,880	159,827
Tennessee	22,779	48,714	52,431	46,524	118,017	42,907	55,609	59,884	53,887	152,403
Alabama	25,038	77,622	82,903	71,803	174,463	72,059	86,546	92,937	76,957	235,562
Mississippi	15,665	25,469	27,365	21,126	62,260	108,320	39,834	43,816	29,836	177,990
East South Central	**86,212**	**203,831**	**218,966**	**192,734**	**482,777**	**261,220**	**243,002**	**265,201**	**221,560**	**725,782**
Arkansas	9,215	20,761	21,777	19,037	49,013	52,621	26,290	27,553	33,180	112,091
Louisiana	10,336	20,037	21,131	16,974	47,347	53,832	23,404	25,772	18,790	96,026
Oklahoma	4,746	10,598	11,029	4,289	19,633	9,900	20,551	22,134	4,583	35,034
Texas	24,429	46,348	48,371	22,934	93,711	144,523	84,756	90,880	24,612	253,891
West South Central	**48,726**	**97,744**	**102,308**	**63,234**	**209,704**	**260,876**	**155,001**	**166,339**	**81,165**	**497,042**
Montana	620	932	969	60	1,612	4,458	11,964	12,336	93	16,515
Idaho	1,484	1,616	1,684	198	3,298	21,987	13,985	14,819	821	36,793
Wyoming	187	287	304	28	502	2,811	3,020	3,088	32	5,863
Colorado	1,741	2,630	2,790	1,101	5,472	18,235	14,350	14,649	1,415	34,000
New Mexico	333	564	590	119	1,016	8,551	7,559	7,776	202	16,312
Arizona	4,384	5,934	6,164	1,266	11,584	48,440	20,160	20,607	1,831	70,431
Utah	372	628	672	204	1,204	7,592	6,547	6,764	238	14,377
Nevada	233	240	249	60	533	926	924	959	74	1,924
Mountain	**9,354**	**12,831**	**13,422**	**3,036**	**25,221**	**113,000**	**78,509**	**80,998**	**4,706**	**196,215**
Washington	4,270	6,656	6,920	4,036	14,962	66,329	17,376	17,969	6,326	90,031
Oregon	2,815	4,598	4,762	2,442	9,855	39,505	12,606	13,088	3,551	55,662
California	33,238	34,730	35,500	19,870	87,838	238,586[3]	85,920[4]	87,793[4]	30,856[5]	355,362
Pacific	**40,323**	**45,984**	**47,182**	**26,348**	**112,655**	**344,420**	**115,902**	**118,850**	**40,733**	**501,055**
Total	**825,943**	**1,785,302**	**1,888,645**	**1,654,145**	**4,265,390**	**2,233.416**	**2,276,335**	**2,636,304**	**1,899,505**	**6,409,256**
Hawaii	7,556	3,409	3,560	11,144	22,109	17,917	6,297	7,324	16,834	41,048
Puerto Rico	21,705	9,879	11,247	18,621	50,205	33,026	10,258	11,631	18,799	62,083
United States:										
1957-58	855,204	1,798,590	1,903,452	1,683,910	4,337,704	2,284,359[6]	2,292,890[7]	2,655,259[8]	1,935,138	6,512,387
1956-57	843,626	1,817,626[9]	1,926,774[10]	1,681,121[11]	4,342,373	2,135,287	2,304,992[9]	2,669,942[9]	1,936,923[11]	6,377,202
1955-56	796,673	1,785,073	1,897,790	1,654,952	4,236,698	1,933,342	2,247,420	2,643,418	1,874,718	6,055,480

[1] Including 2 percent of the colloidal phosphate and 3 percent of the phosphate rock marketed for direct application. [2] Including an average of 21.71 percent of the colloidal phosphate and 31.68 percent of the phosphate rock marketed for direct application. Including an estimated: [3] 3,426 tons, [4] 3,153 tons, and [5] 6,763 tons marketed as dried manures. Including: [6] 976 tons, [7] 6,445 tons, and [8] 6,578 tons in materials distributed by Government agencies for test demonstrations. [9] Revised by addition of 1,001 tons in North Dakota. [10] Revised by addition of 360 tons in Kansas and 1,001 tons in North Dakota. [11] Revised by subtraction of 1,340 tons in Pennsylvania.

cific region aqua ammonia supplied a large part of the nitrogen, while in the Middle Atlantic region 80 percent of the nitrogen was in N-P-K mixtures.

More than 76 percent of the national consumption of available P_2O_5 was in two commodities—N-P-K mixtures and superphosphate grades over 22 percent P_2O_5—which supplied, respectively, 68.8 and 7.4 percent. They supplied 39 percent

Table 12.—Change in consumption of primary nutrients, year ended June 30, 1958, compared with preceding year

Tons

State and region	Mixtures					Materials				
	N	P_2O_5		K_2O	Total (N, avail. P_2O_5, and K_2O)	N	P_2O_5		K_2O	Total (N, avail. P_2O_5, and K_2O)
		Available	Total				Available	Total		
Maine	1,594	1,275	1,187	1,308	4,177	—878	348	351	12	—518
New Hampshire	104	68	72	81	253	—125	29	38	29	— 67
Vermont	338	174	183	196	708	57	—167	—172	14	— 96
Massachusetts	228	312	308	—567	— 27	119	— 73	— 88	— 59	— 13
Rhode Island	72	13	— 2	1	86	11	— 4	— 52	— 15	— 8
Connecticut	—134	—497	—528	—210	—841	182	—121	—149	— 66	— 5
New England	**2,202**	**1,345**	**1,220**	**809**	**4,356**	**—634**	**12**	**— 72**	**— 85**	**—707**
New York	3,859	5,426	4,083	6,764	16,049	1,612	—1,157	—1,231	377	832
New Jersey	—2,402	—4,981	—5,118	—4,856	—12,239	95	—253	—265	50	—108
Pennsylvania	261	2,394	2,434	811	3,466	1,064	—783	—458	114	395
Delaware	—118	—599	—654	—623	—1,340	— 76	—120	—122	—125	—321
District of Columbia	117	106	112	70	293	13	10	7	4	27
Maryland	44	—1,543	—1,631	—1,255	—2,754	455	—119	—140	— 37	299
West Virginia	—303	—806	—846	—879	—1,988	—105	— 80	— 54	38	—147
Middle Atlantic	**1,458**	**— 3**	**—1,620**	**32**	**1,487**	**3,058**	**—2,502**	**—2,263**	**421**	**977**
Virginia	—488	—5,486	—5,921	—3,790	—9,764	—760	417	634	38	—305
North Carolina	2,891	—2,339	—2,499	6,498	7,050	—6,101	—404	—545	—506	—7,011
South Carolina	—851	—3,258	—3,546	—1,245	—5,354	—6,947	—1,026	—1,166	—2,651	—10,624
Georgia	—6,989	—3,112	—3,564	719	—9,382	8,303	425	1,677	—203	8,525
Florida	794	—3,223	—3,723	4,078	1,649	3,538	1,554	—2,605	671	5,763
South Atlantic	**—4,643**	**—17,418**	**—19,253**	**6,260**	**—15,801**	**—1,967**	**966**	**—2,005**	**—2,651**	**—3,652**
Ohio	2,908	671	245	—3,058	521	3,723	1,050	2,062	1,593	6,366
Indiana	2,261	—1,370	—1,703	—3,763	—2,872	9,939	1,390	1,349	4,878	16,207
Illinois	3,838	6,813	7,075	5,746	16,397	12,544	4,021	5,381	1,907	18,472
Michigan	—1,188	2,651	2,743	1,236	2,699	2,137	523	873	2,764	5,424
Wisconsin	1,262	1,594	2,314	4,261	7,117	2,483	294	85	918	3,695
East North Central	**9,081**	**10,359**	**10,674**	**4,422**	**23,862**	**30,826**	**7,278**	**9,750**	**12,060**	**50,164**
Minnesota	776	—2,029	—1,649	—1,912	—3,165	10,406	1,235	1,307	1,949	13,590
Iowa	2,662	7,115	7,366	2,801	12,578	12,245	4,911	4,148	2,608	19,764
Missouri	267	—7,896	—8,117	—6,159	—13,788	477	— 76	2,481	—2,331	—1,930
North Dakota	630	—474	—469	62	218	3,835	8,099	8,236	— 14	11,920
South Dakota	322	47	62	— 15	354	2,525	1,026	1,040	10	3,561
Nebraska	950	1,726	1,747	246	2,922	30,188	—3,426	—3,428	— 29	26,733
Kansas	—884	—2,624	—2,700	—898	—4,406	2,647	—3,212	—3,316	—298	—863
West North Central	**4,723**	**—4,135**	**—3,760**	**—5,875**	**—5,287**	**62,323**	**8,557**	**10,468**	**1,895**	**72,775**
Kentucky	1,356	249	187	669	2,274	986	—2,124	—2,865	—624	—1,762
Tennessee	—176	—1,941	—2,069	—1,746	—3,863	—5,572	—749	—677	—606	—6,927
Alabama	—2,842	—6,193	—6,661	—1,255	—10,290	—3,604	—957	—1,448	—623	—5,184
Mississippi	—2,339	—4,357	—4,673	—4,573	—11,269	—14,021	—3,378	—3,749	—5,534	—22,933
East South Central	**—4,001**	**—12,242**	**—13,216**	**—6,905**	**—23,148**	**—22,211**	**—7,208**	**—8,739**	**—7,387**	**—36,806**
Arkansas	95	688	677	151	934	—5,992	—2,033	—2,089	—3,936	—11,961
Louisiana	—61	—2,396	—2,451	308	—2,149	740	—369	—206	—1,582	—1,211
Oklahoma	—211	—169	—200	— 74	—454	143	382	653	33	558
Texas	2,124	341	421	1,361	3,826	33,001	—3,304	—1,731	511	30,208
West South Central	**1,947**	**—1,536**	**—1,553**	**1,746**	**2,157**	**27,892**	**—5,324**	**—3,373**	**—4,974**	**17,594**
Montana	187	135	138	16	338	—1,638	—347	—364	— 1	—1,986
Idaho	81	108	— 35	— 16	173	7,514	1,005	1,623	489	9,008
Wyoming	24	47	49	— 4	67	780	110	106	— 15	875
Colorado	440	520	559	310	1,270	6,262	1,321	1,317	—132	7,451
New Mexico	145	314	324	64	523	349	—523	—555	— 26	—200
Arizona	956	1,755	1,810	432	3,143	5,690	2,885	2,917	—140	8,435
Utah	—153	— 82	— 90	17	—218	2,551	933	911	— 3	3,481
Nevada	120	97	96	— 6	211	134	372	387	12	518
Mountain	**1,800**	**2,894**	**2,851**	**813**	**5,507**	**21,642**	**5,756**	**6,342**	**184**	**27,582**
Washington	1,188	1,958	2,010	824	3,970	21,200	3,722	3,820	482	25,404
Oregon	281	—160	—170	—175	— 54	—2,979	—2,090	—2,054	1	—5,068
California	3,028	5,973	5,981	4,073	13,074	12,290	—409	—931	— 7	11,874
Pacific	**4,497**	**7,771**	**7,821**	**4,722**	**16,990**	**30,511**	**1,223**	**835**	**476**	**32,210**
Total	**17,064**	**—12,965**	**—16,836**	**6,024**	**10,123**	**151,440**	**8,758**	**10,943**	**— 61**	**160,137**
Hawaii	—129	—2,411	—2,461	13	—2,527	—12,551	—1,657	—2,137	—4,573	—18,781
Puerto Rico	—5,357	—3,660	—4,025	—3,248	—12,265	—1,395	—167	—167	60	—1,502
United States	**11,578**	**—19,036**	**—23,322**	**2,789**	**—4,669**	**137,494**	**6,934**	**8,639**	**—4,574**	**139,854**

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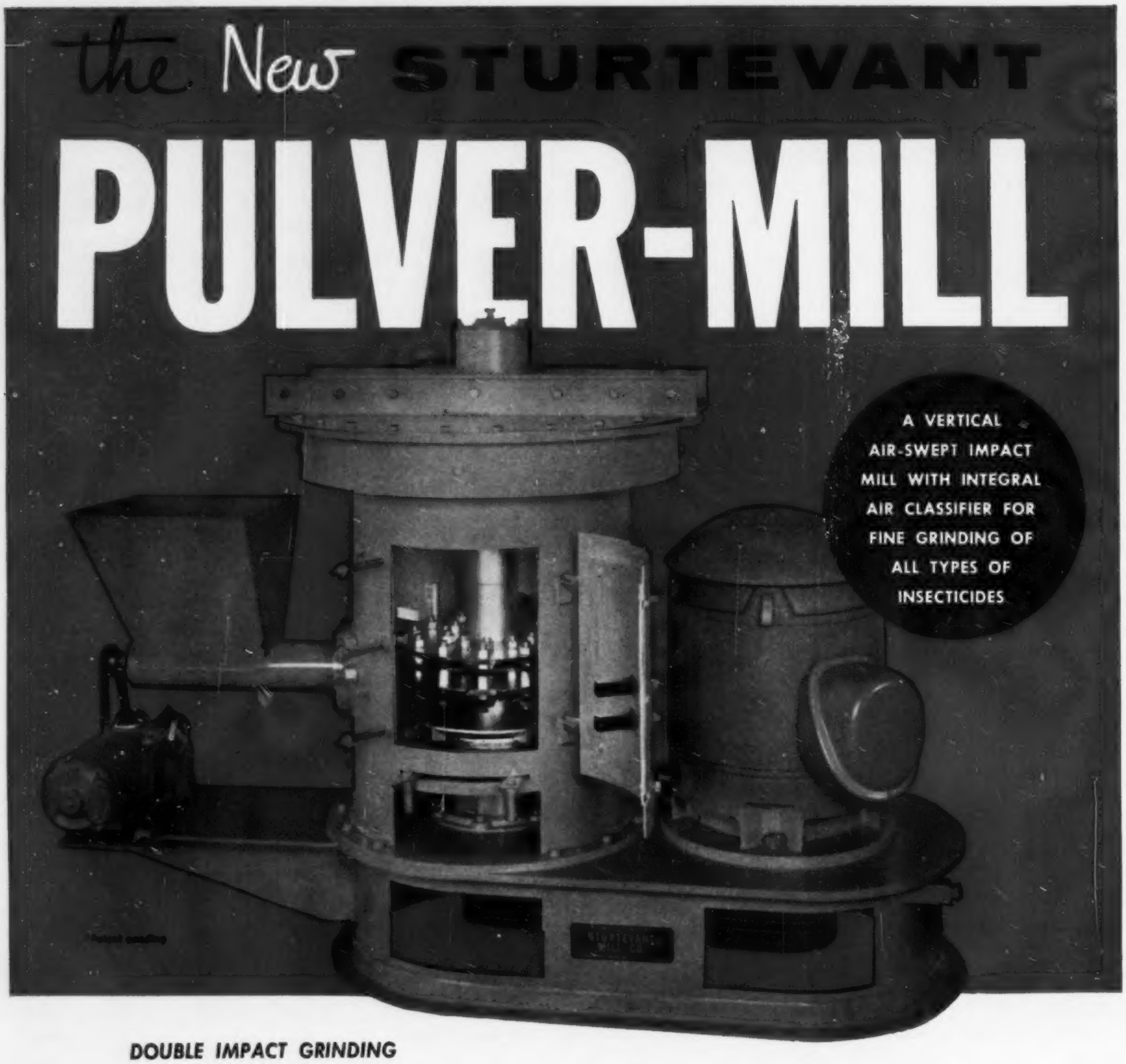

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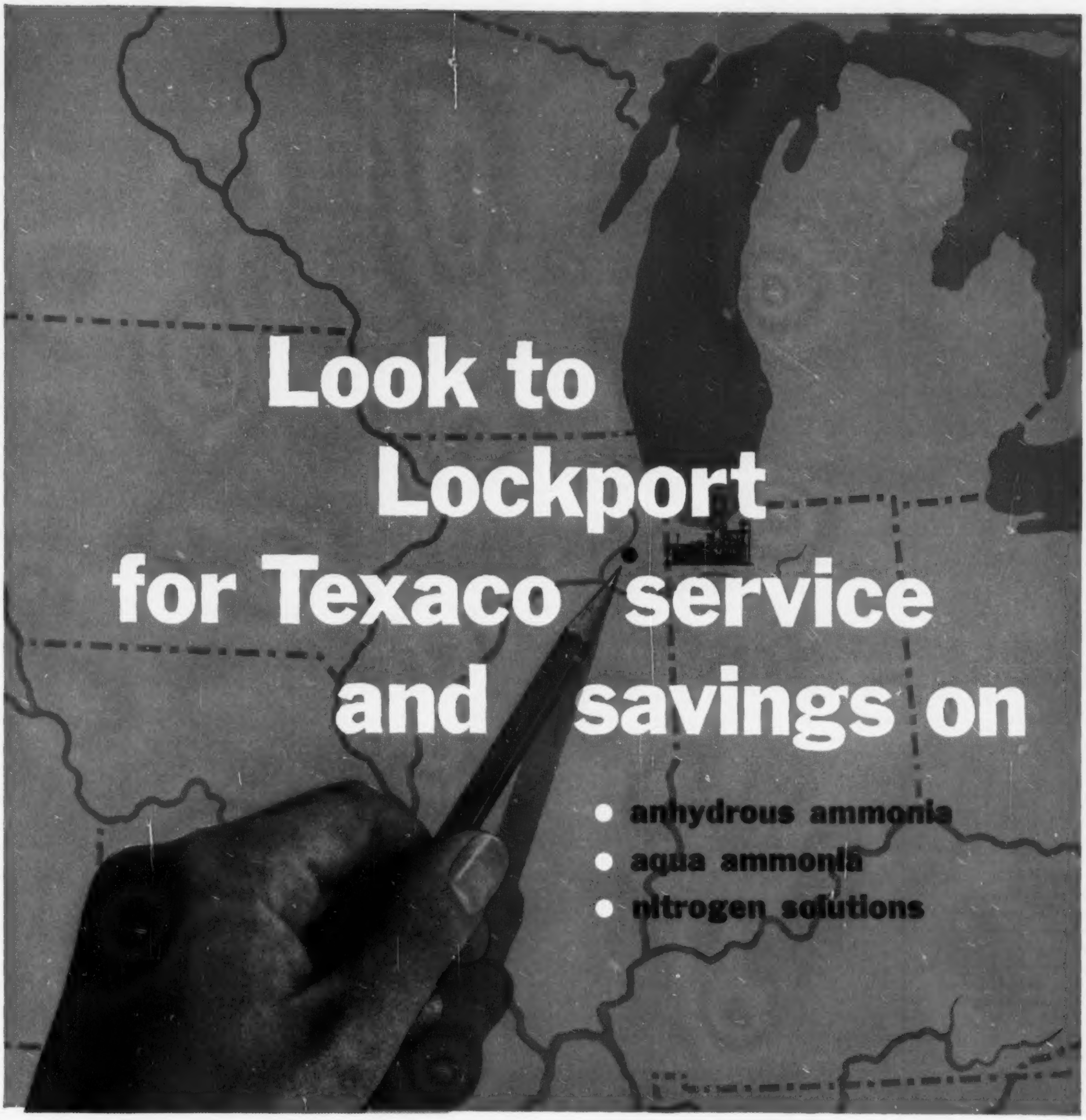
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(Pacific) to 91 percent (South Atlantic) of the regional consumptions. Ammoniated phosphates supplied an important part of the P_2O_5 in the western part of the country.

N-P-K mixtures supplied more than 76 percent of the national consumption of K_2O. The regional proportions ranged from 61 to 86 percent. Its use as potassium chloride or as N-K mixtures was important in some areas.

Table 13.—Primary plant nutrients consumed in regions and United States as mixtures and as direct-application materials, by kinds, year ended June 30, 1958

Tons

Kind	New England	Middle Atlantic	South Atlantic	East North Central	West North Central	East South Central	West South Central	Mountain	Pacific	Hawaii and Puerto Rico	United States
						Nitrogen					
MIXTURES: N-P-K	26,670	98,147	198,257	191,508	80,363	85,126	45,021	4,149	28,763	24,172	782,176
N-P	1	16	24	3,657	17,265	651	3,704	5,193	11,368	121	42,000
N-K	0	12	25,354	40	14	435	1	12	192	4,968	31,028
MATERIALS:											
Ammonia, anhydrous	0	2,040	20,669	46,921	114,200	42,554	114,880	35,101	102,110	634	479,109
Ammonia, aqua	0	0	170	556	1,894	9	1,618	5,394	57,824	5,877	73,342
Ammonium nitrate	1,603	10,706	46,042	46,329	82,097	95,997	35,832	23,712	34,371	0	376,689
Ammonium nitrate-limestone mixtures	34	453	46,591	417	36	6,369	110	736	12	0	54,758
Ammonium sulfate	109	931	2,451	20,279	2,468	2,469	20,556	13,289	46,980	11,029	120,561
Bonemeal: raw and steamed	42	118	35	47	8	8	13	*	56	0	327
Calcium cyanamide	288	1,890	1,886	214	39	2,007	1,341	247	1,825	0	9,737
Calcium nitrate	*	*	1,569	18	0	23	20	1,866	5,351	17	8,864
Natural organics	1,385	1,731	1,220	2,077	607	90	335	345	5,469	7	13,266
Nitrogen solutions	273	1,397	23,856	17,731	29,383	2,997	7,302	1,862	15,096	0	99,897
Phosphate products	0	76	331	2,050	21,432	742	13,648	12,208	22,438	395	73,320
Potassium products	24	1	1,979	6	0	187	3	0	3	0	2,203
Sodium nitrate	253	1,663	39,039	224	46	20,998	7,952	80	62	22	70,339
Urea	490	1,663	1,734	5,419	1,726	548	8,462	8,655	12,316	3,701	44,714
Other chemical nitrogen products	64	590	141	671	140	10	78	151	184	0	2,029
Total nitrogen	**31,236**	**121,434**	**411,348**	**338,164**	**351,718**	**261,220**	**260,876**	**113,000**	**344,420**	**50,943**	**2,284,359**
						Available P_2O_5					
MIXTURES: N-P-K	37,640	185,669	406,202	463,771	171,123	175,771	84,155	6,342	33,668	12,236	1,576,577
N-P	3	44	17	16,340	38,728	680	7,467	6,338	11,814	493	81,924
P-K	5,720	20,067	22,393	42,277	14,918	27,380	6,122	151	502	559	140,089
MATERIALS:											
Ammonium phosphate: 11-48	0	229	22	4,706	21,966	5	1,688	4,472	6,829	532	40,449
Ammonium phosphate: 13-39	0	0	0	87	7,263	9	5,803	2,264	2,421	0	17,847
Ammonium phosphate sulfate: 16-20	0	0	0	193	15,569	15	13,895	9,752	21,374	52	60,850
Ammonium phosphate nitrate: 27-14	0	0	0	0	465	0	0	670	1,473	0	2,608
Basic slag	0	0	1,554	0	0	10,028	273	0	0	0	11,855
Bonemeal: raw and steamed	385	1,074	322	531	59	81	86	*	493	0	3,031
Calcium metaphosphate	0	371	1,539	7,298	9,779	8,800	532	169	16	0	28,504
Diammonium phosphate: 21-53	0	61	837	2,062	2,972	1,876	1,624	4,213	554	603	14,802
Natural organics	674	968	559	1,534	603	63	286	260	4,505	4	9,456
Phosphate rock and colloidal phosphate	8	227	552	16,978	6,518	422	550	5	39	84	25,383
Phosphoric acid	0	0	0	0	0	0	863	5,762	5,574	0	12,199
Potassium products	10	0	35	0	0	0	0	0	0	0	45
Superphosphate: 22% and under	6,120	14,184	9,728	11,956	8,362	14,847	12,041	3,137	13,715	1,192	95,282
Superphosphate: over 22%	47	1,349	2,658	35,143	60,864	2,961	19,616	34,974	12,436	800	170,848
Other phosphate products	114	0	474	0	0	64	0	0	489	0	1,141
Total available P_2O_5	**50,721**	**224,243**	**446,892**	**602,876**	**359,189**	**243,002**	**155,001**	**78,509**	**115,902**	**16,555**	**2,292,890**
						K_2O					
MIXTURES: N-P-K	37,990	166,819	415,433	450,882	133,161	164,946	57,510	2,937	25,719	21,897	1,477,294
P-K	7,224	22,116	33,834	56,799	14,154	27,190	5,723	96	479	895	168,510
N-K	0	13	30,308	43	17	598	1	3	150	6,973	38,106
MATERIALS:											
Lime-potash mixtures	0	5	1,268	0	0	380	0	0	0	0	1,653
Manure salts	0	1	90	0	0	0	7	0	0	0	98
Natural organics	295	360	196	528	231	24	84	63	7,075	1	8,857
Potassium chloride	1,091	2,902	21,507	117,337	27,490	24,800	17,398	1,000	3,652	4,741	221,918
Potassium magnesium sulfate	16	306	449	759	78	251	269	9	59	1	2,197
Potassium sodium nitrate	0	1	1,993	6	0	160	2	0	0	0	2,162
Potassium sulfate	58	685	2,641	1,701	1	3,211	61	598	3,569	1,125	13,650
Other potassium products	200	5	213	135	0	0	110	0	30	0	693
Total K_2O	**46,874**	**193,213**	**507,932**	**628,190**	**175,132**	**221,560**	**81,165**	**4,706**	**40,733**	**35,633**	**1,935,138**
GRAND TOTAL: N, avail. P_2O_5, K_2O	**128,831**	**538,890**	**1,366,172**	**1,569,230**	**886,039**	**725,782**	**497,042**	**196,215**	**501,055**	**103,131**	**6,512,387**

* Less than 0.5 ton.

—of This and That . . . .

_____Bill Hancock of Dallas, Texas is really 'in tall cotton' this year. Mr. Hancock, owner of Hancock Chemical Company, planted a single cotton plant inside his office and applied a hormone growth stimulant to it. With proper applications of water, fertilizer and insecticides, the stalk was soon out of hand and he had to transplant it in a narrow strip of soil behind the company's building. By August 10, the stalk had topped the ten foot mark and had more than a hundred bolls, half of them already open.

_____The U.S. will demonstrate its newest techniques of agricultural research, production and marketing at the First World Agriculture Fair in New Delhi, India December 11 to February 14. Research in wheat, corn, fertilizers and chemicals will be among the demonstrations, which will also reveal how research information is communicated rapidly to the farmer.

_____One of the eye-catching exhibits at the recent U.S. Fair in Moscow was Hudson Pulp and Paper's new multiwall bag with built-in side handles. Accustomed to carrying heavy burdens on their backs and shoulders, the Soviet men and women were intrigued by the bags with the suitcase-type grip, ranging up to 50-pound capacity.

_____The Connecticut Agricultural Experiment Station boasts an ever-increasing number of visitors who come to learn firsthand about research in genetics, entomology and plant sciences related to tobacco production. So far this year visitors have arrived from Argentina, Australia, Austria, Brazil, Canada, Ceylon, Columbia, England, Germany, Holland, Iceland, India, Japan, Korea, Mexico, Norway, Poland, Spain, South Africa, Sweden, Switzerland, and Turkey . . . but the foreign visitors are heavily outnumbered by scientists and students from the U.S. who come there for specific information in research.

_____Every now and then, the newspapers pick up a statement by some crank who has a 'solution' for the farm 'problem' that involves imposing a high tax on fertilizers which would supposedly reduce the use of these materials and thereby . . . according to the theorist . . . eliminate overproduction and mounting surpluses. Just last month, the Milwaukee Journal quoted a statement from the Janesville Gazette by a Chicagoan who had outlined such a proposal. The item ended with this paragraph: "It is easy to answer the suggestion by saying that this man doesn't 'understand' the farm problem . . . But then, it is becoming increasingly difficult to find anyone who does."

_____A sixty-year precedent was shattered last month when a woman was elected president of the American Rose Society. Mrs. Nat Schoen of Vancouver, Washington was elected to the office for 1960 by more than 3000 votes of the 16,500 cast.

_____Spencer Chemical's 'Operation Omnibus' gets under way this month with a slogan "Don't Just Fertilize, Spencerize." Farm papers, radio, fair displays and a 13-minute movie titled 'Fertilizer First' will carry out the theme by featuring Spencer's four nitrogen products. The company's agricultural chemicals salesmen were treated to a preview of the campaign at meetings held recently at Gull Lake, Minnesota and Memphis, Tennessee.

_____We notice more and more of our subscribers using their check vouchers to promote the industry and their own products. Cooperative Fertilizer Service at Louisville, Ky. features this message: "Be wise—fertilize."

_____Back in June we had a letter from Mrs. Maurice T. Link of Parma, Ohio, enclosing a check for a subscription to CF. Her note said "I would like to give a subscription to your Commercial Fertilizer magazine to my father, who is a retired fertilizer plant manager, as a Father's Day gift. Please enter the subscription for Mr. W. H. Woodard, 4007 Galloway Road, Sandusky, Ohio." . . .A real compliment to CF, Mrs. Link, and we are glad to welcome your father back as a reader.

_____And this line to end all such lines (Jack Paar to the contrary!): St. Louis billboard plug for a new garden tool—"Take me to your weeder."

_____Agriculture today needs promotions aimed at new and entirely different outlets for surplus food products. An example is the 'Spud Gun,' already a popping success in New York, where more than a million guns have been sold. It seems this is a sort of popgun that shoots harmless potato pellets. Its makers are planning for sales of ten million Spud Guns this year. If each child receiving one of the novelty toys shoots only ten pounds of potatoes, the Spud Gun could provide a market for 100 million pounds of potatoes in a year, according to Spuds Johnson of the Florida Agricultural News Service.

Kentucky Names Advisory Committee

At the annual Kentucky fertilizer conference the manufacturers represented elected Gene VanDeren, Bluegrass Plant Foods, Inc., Cynthiana, Kentucky to serve as the fourth industry member of the Industry-College Fertilizer Advisory Committee. His term of service is August 1, 1959 to July 31, 1963.

The other industry representatives on this committee and their terms of service are: Harold Douthit, International Mineral and Chemical Company, Cincinnati, Ohio, August 1, 1959 to July 31, 1960; Morris Newman, Price Chemical Company, Louisville, Kentucky, August 1, 1959 to July 31, 1961; J. A. Hicks, Commonwealth Fertilizer Company, Russellville, Kentucky, August 1, 1959 to July 31, 1962.

The members of the staff of the University of Kentucky and the department from which they were elected who will serve on this committee for the period August 1, 1959 to July 31, 1960 are: Bruce Poundstone, Feed and Fertilizer, Chairman of the Committee; Harold Miller and E. C. Doll (alternate), Agronomy; L. H. Townsend and J. G. Rodriguez (alternate), Entomology and Botany; Harry Allen and W. J. Huffman (alternate), Feed and Fertilizer; Carl Chaplin and Donald Cotter (alternate), Horticulture.

obituaries

Francis W. Darner, 58, for 18 years with the Tennessee Corp. died September 9 in Washington D.C. of a heart attack.

Kenneth A. Keith, 43, 12 years with Spencer Chemical, and just announced as manager of a new district office in Omaha, died September 10 of a heart attack as he was preparing to move.

Barnard C. Manker, 31 years with Davison Chemical and with Michigan Fertilizer before Davison acquired it, of a heart attack in Lansing, Michigan, August 30.

Rufus A. McQueen, Robeson Mfg. Co., died September 8 in Lumberton, N. C.

Mrs. Philip MacGregor Shuey, wife of the Shuey & Co. president, died September 3 in Savannah, Georgia, after a short illness.

Looking Ahead in Soil Testing

by Werner L. Nelson, J. Fielding Reed, and R. D. Munson*
American Potash Institute

The purpose of this paper is to raise a few questions and encourage more thinking as to the changes which might take place in soil testing in ten years or so.

The aim of business is to strive for the greatest efficiency possible and to use the best technical and management assistance available. Every indication is that the farmer likewise must consider his farming operation as a business in competition with his neighbor.

Soil testing is a readily available and easily usable management skill. While soil testing is only one of the many tools to assist the farmer in doing a precision job, it is an important link that demands top flight soil testing programs. Thus we need to think ahead and consider what the agricultural producer might want in a few years. We must keep in mind that he will have a high investment business operation and will be interested in maximum profits. He will want to eliminate as many limiting factors as possible. A controllable factor, such as plant nutrient supply, will be taken care of.

There are five general phases of a soil testing program: **1.** Sampling. **2.** Analysis. **3.** Calibration. **4.** Interpretation and recommendations. **5.** Evaluating the success.

While several of these points will be mentioned, much of the discussion will center around interpretation and recommendations. Within ten years some of the changes mentioned will not be entirely completed. However, certain trends may be evident from which we can extrapolate. We at all times must keep in mind that the prime objective of soil testing is to bring about the most efficient and profitable use of lime fertilizer by the agricultural producers.

Place of soil testing ten years hence

All business operations take a periodic inventory of their resources. All farmers likewise consider certain aspects of their operation in figuring their income tax. Each knows how many cattle, hogs, etc., he owns. Today, however, very few have an inventory of their soil resources.

It is not necessary to repeat what we already know in regard to economic pressures forcing full-time farmers of the future into an efficient operation. Those who obtain all their income from the farm will be forced to have an inventory of their soils to stay in business. Soil testing will thus become a necessary operation in farming.

Numerous surveys have shown the importance of soil testing in encouraging the farmer to use fertilizer. For several years some in the fertilizer industry have been stressing soil testing, to the advantage of the farmer as well as themselves through greater sales. At present, much of the industry is awakening to the importance of soil testing. In the next ten years the fertilizer industry could be an extremely important factor in increasing the use of soil tests.

Connecting Link Between Soils Research and the Farmer

Some soil scientists have had reservations as to the value of soil testing. These reservations are gradually being dispelled and soil testing is enjoying greater acceptance from this group. The ultimate aim of soils research is to assist in solving crop production problems. Soil testing is a very important link between this research and the farmer. Admittedly much is yet to be learned in the field of soil and plant chemistry, but much progress has been made in the last few years.

Dr. A. G. Norman, past president of the American Society of Agronomy, has expressed an important viewpoint "It might be pertinent to ask whether there is any way of determining the absolute nutrient requirements of a plant, or whether such information would be meaningful if it were obtained. An ideal nutritional environment indeed may be one in which all nutrient elements are available to the point of slight luxury consumption at all times." (Agron. Jour. 49:618-620. 1957).

Sampling

Who will do the sampling? One might predict that as soil testing and fertilizer usage matures, the supplying of proper amounts of plant nutrients will be developed more and more on a service basis. This would mean that someone other than the farmer would take over much of the sampling. Sampling could be a part of the complete service rendered by a laboratory or the fertilizer industry. A sampling service on a charge basis has been initiated in several Michigan counties as a part of the extension program.

Number of samples. In the period 1955 to 1957 the number of samples increased 35 percent in United States. In some states numbers of samples might double in ten years. Certainly the trend will be upward as soil testing becomes a cog in the farmer's business operation.

Frequency of sampling. Sampling every three to five years should be adequate. With heavy corrective applications of plant nutrients the soil would probably not reach a stage of adequate mixing for sampling in much less than three years. With the gradual nutrient buildup type of recommendation the fertility level of the soil or the needs of the crops would not change rapidly enough to warrant resampling in much less than five years. Based on the one sample more effort will be made to provide recommendations for the next three or four crops in the rotation.

Method of sampling. As fertilizer use increases it becomes more difficult to take a representative sample. One core of soil which contains a high concentration of phosphorus or potassium may distort the reading for the whole sample. There may be a trend to fewer cores per composite sample and more samples. Illinois has been using a system of five cores per composite and 11 composite samples per 40 acres.

Who is reached in a soil testing program?

The amount of fertilizer that a farmer can use profitably depends greatly upon his management ability. Hence, it is important to know

* Midwest Director, Southern Director, and Agronomist, respectively, American Potash Institute.
This paper was presented at American Chemical Society's Soil Testing Symposium September 15.

what level of farmer is reached in a soil testing program. Where soil samples are taken and sent in outside of governmental aid programs, the better farmer is no doubt sending in the samples. Of course, where the samples are taken thru ASC program service sampling, or where a county makes soil tests mandatory in order to receive payment for certain practices, the entire range of farmers will be represented.

Keeping in mind the above and the limitations of survey data, the estimates in Table 1 from a survey conducted in the Midwest by a NPFI Research and Education Committee may be of interest.

The obvious conclusion is that the higher yields are due to more effective use of fertilizer and lime. However, the fact that these farmers are able to employ high rates to advantage indicates that they probably possess above-average management ability. Too, the fact that the farmer uses the soil testing service is a favorable reflection on his management ability.

Who is doing the producing? It is of interest to study just who is doing the producing (1954 census data).

Number of farmers		Percent of Total number	Percent of Total production
1,290,000		27%	79%
812,000		17%	12%
1,226,000		26%	7%
1,455,000	(part-time)	30%	2%

Much emphasis in education is placed on the 73% of the farmers who produce a relatively small part of the total. Will there be and should there be greater concentration on the 27% or the upper quartile who are doing the bulk of the producing?

Economists have predicted that in the not too distant future there will be only 1,000,000 farmers in United States. What will these farmers want in the way of soil testing service?

It thus seems of great importance that we know with whom we are working and their objectives. A summary of certain data on the soil test information sheet such as previous yields, yield desired, size of farm, number of acres sampled in any one year, etc., might assist in formulating future soil testing programs.

Level of recommendations

One of the best ways to encourage the use or sale of a product is to have one that performs much better than the one the consumer already possesses. If a farmer is averaging 80 bushels of corn per acre are our recommendations based on soil tests enough better to really sell the soil testing program? Are the top 5 to 10 percent of the farmers already ahead of our educational programs and information?

If the recommendation is just average, the value of soil testing is greatly reduced. It may do more harm than good as it creates doubt in the minds of good farmers. Too, soil testing is being promoted among the fertilizer industry on the basis that more fertilizer will be sold. In the next few years, as the farmers' usage of fertilizer increases, this may not always be true. Recommended rates may be considerably less than the amounts used by the leaders.

Two or more levels. In some soil testing programs recommendations are at two or more levels. Iowa uses three levels. An example from Minnesota is shown below:

	*N lbs./A	P_2O_5 lbs./A	K_2O lbs./A
Soil test		75 bushels of corn	
High	60	20	0
Medium	80	40	60
Low	100	40**	120
		100 to 140 bushels of corn	
High	60	20	20
Medium	100	60	80
Low	140	80	160

* after non-legumes
** very low P test, apply additional 20 to 30 lbs.

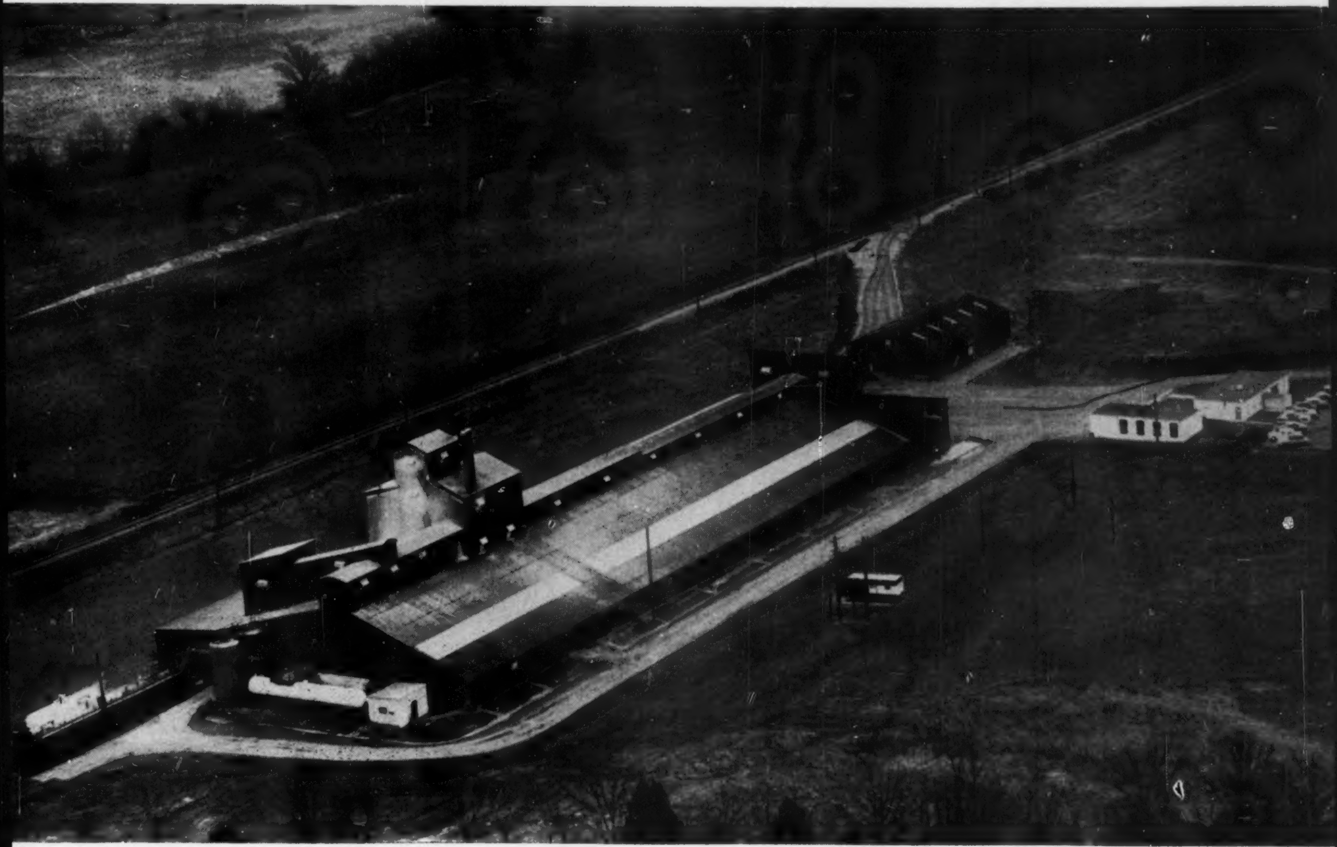
Such an approach seems tc have merit. It provides something for the highest quartile of farmers, the ones who really are making a significant contribution. It provides for the lower level farmers, some of whom need the slower type of education.

In ten years a more positive approach might be to give the top level recommendations and management practices in all reports as the first choice. Then qualification might be made that if the farmer is not planning to his best in stand, pest control, variety, management, etc., he can use the lower recommendation. The penalty he is imposing on himself might well be spelled out, however.

Buildup approach. In this type of recommendation enough nutrients are supplied for good crop yields and also for nutrient buildup on soils testing low and medium. In

Table 1. Goals, Yields and Averages Under a Soil Test Program

	No. of States	State Average 1953-57	Yield of farmers sending in soil samples	Goals in soil test program
Corn (bu.)	9	44.6	61.2	82.4
Wheat (bu.)	9	20.3	27.2	36.0
Alfalfa (T.)	8	1.9	2.8	3.8
Soybeans (bu.)	7	18.6	24.0	31.1



Ohio, the suggested average annual application of P_2O_5 and K_2O in the rotation is 80 lbs., 60 lbs., and 40 lbs. per acre at the low, medium and high levels respectively. N is suggested according to crop and rotation.

These recommendations are designed to supply nutrients for 100 to 125 bushels of corn, 40 to 50 bushels of wheat, 80 to 100 bushels of oats, 35 to 40 bushels of soybeans, and 4 to 5 tons of hay per acre.

A well balanced fertility program involves two definite stages (1) building fertility reserve to a reasonably high level, and (2) maintaining the fertility level once a high level is reached. Much emphasis will be placed on this approach in the next few years with the idea of keeping the sights high.

Detail of recommendations

There is a trend to report a fewer number of levels. Only five are being used in some states with some reporting just three—low, medium, and high.

Perhaps the test should be used merely to indicate levels in the soil. Recommendations may then indicate the amounts necessary to raise the nutrient to the optimum level. Below is an example from the Purdue testing program:

Test Value	P_2O_5 to raise P test level to 180 lbs./A
0 - 25	400
26 - 50	300
51 - 75	225
76 - 100	150
101 - 125	90
126 - 150	50

Possibly too much emphasis has been placed on the "recommendation" as such. Actually, the soil test does not tell the kind of fertilizer to use. It assists in evaluating the fertility level of the soil. With this information, one can better estimate the fertilizer needs.

Agricultural producers and agricultural leaders could learn to use the soil test results for what they are—facts about the soil. If a soil is acid or low in a particular plant nutrient, a farmer could take this into account and plan to correct the condition. How this is done is bound to vary with the farmer. Over the years, records could be kept of changes in fertility levels and corrective treatments.

When the farmer learns this simple approach, with some guidance from the agricultural leader, he can do his own interpreting as far as lime and fertilizer needs are concerned. Then the soil test serves its real function—to give further information about the soil—rather than as an infallible figure which must be translated from some table into so many pounds of a certain grade of fertilizer.

Uniformity of reporting

The variation in reporting from one state to another is confusing to the person attempting to use soil testing. Farmers operating near a state line or the fertilizer industry operating in several states have difficulty in seeing why a river or a state line should materially affect recommendations.

Sometimes it is said that uniformity would not be desirable because it would kill initiative. There is ample opportunity for initiative in research and development of soil testing. When it comes to actual use, however, there may not be too much reason for widely divergent methods of reporting results and making recommendations. With the various regional soil test committees at work, some of these problems are gradually being brought out and approached.

Amount of service demanded

As the farmer operates more land he will want more specialized information. When a program passes from the research to the service stage, the question arises as to who should be providing the service. The following are possibilities: **(1)** More from Extension? While Extension at present is not set up to provide much more specialized information, it is using soil testing as an educational tool. **(2)** Service from industry agronomists. **(3)** Service from a commercial laboratory with advice on a number of management phases. **(4)** A specialist employed by a group of farmers. **(5)** A full-time specialist employed by one farmer.

It appears that the farmer will demand more and more service depending on the size of his operation. He will be willing to pay for it. If the extension service cannot meet this demand commercial agencies will step in and do the job.

Who will be doing testing and recommending?

(1) **Official laboratories (central or county).** They will be doing much of the testing, particularly in the newer testing areas, and where the official leaders insist on it. In the central lab system there is a trend to have more and more of the recommendations made by county agents or by district agronomists. This follows the need for more intelligent recommendations based on individual needs.

This testing service might be used by the specialist the farmer employs. The specialist would make the recommendation based on response curves obtained by the college.

(2) **Private laboratories and consulting firms.** A package program of testing and management service should gain rapidly in popularity. Service might be "built in" and be an all inclusive soil, crop, and livestock management program. One would wonder if it would be possible for the college to develop standard procedures for use by the laboratories.

(3) **Fertilizer companies.** The industry can do much to foster getting the samples taken and many feel this to be their most important role in soil testing. It would appear that expansion in the area of testing will be limited.

Evaluation of residual fertility

Evaluation of carryover fertility. The following statements are significant: "Optimum application of fertilizer to corn on a one-year basis contributes substantially to succeeding crops. If residual effect also is considered in estimating the most profitable level of application of fertilizer to corn, the optimum level is higher than it would be on a one-year basis." (Subcommittee on Economics of Fertilizer Use of the North Central Farm Management Research Committee, North Central Regional Publication No. 54, Madison, Wisconsin).

It has not been the usual practice to consider fully, residual benefits in making fertilizer recommendations. One might wonder if a major problem in many recommendations is not the inadequate attention to residual effects. While immediate return on the fertilizer investment is important, the better farmers are interested in top returns over the years.

The need to place a price tag on residual fertility will be a must for the progressive grower 10 years from now. Detailed economic evaluation is needed. The calibration of our soil tests to evaluate residual effects and the establishment of response tables will be an important task.

Research

Many of our field calibration studies are already out of date because of limiting factors such as stand, insect damage, inadequate variety, improper placement, etc. It is difficult to predict what management practices farmers will be using 10 years from now. It would seem essential

to conduct field calibration studies with management practices ten years ahead of our time. This will ensure that we will be ready with the answers when the grower demands them.

A central Indiana farmer has an eight-year average of 190 bushels in the Indiana Five-Acre Corn Contest. He applied very high rates of N, P_2O_5 and K_2O. According to present day standards his soil tests extremely high in P and K. However, what does it take for such a long-time average yield?

Research on soil and plant chemistry for both major and minor elements must continue if diagnostic techniques are to continue to improve. Up to now the Land Grant Colleges and USDA have been doing the research. The question might be raised as to who will be doing the research for the private laboratories and consulting firms in the future. If the research is to be continued by official agencies, more help should be given by industry either by direct grants or by aid in obtaining appropriations. Will the agricultural producer be sufficiently convinced of the value of the service to pay for not only the technological performance of the test and its interpretation, but also for the research behind the soil test?

Plant tests

This diagnostic tool appears to have great potential for use along with soil tests. Actually plant composition should better reflect availability of nutrients to the plant than can soil tests. Perhaps the greatest use in annual crops is for predicting needs in subsequent years.

Personnel

An important problem in soil testing is setting the sights high in quality of the leader and then keeping this personnel. In some states the soil testing laboratory is used as the training ground for graduate students. As soon as one completes his graduate work another one moves in. Too, it may be difficult to keep well trained personnel. In one state testing laboratory there were six directors in 10 years, all Ph.D's. Fortunately more emphasis on the key nature and the importance of the soil testing program is now being given by the administration in most states.

The changes in certain aspects of soil testing appear to be quite marked in the near future. It will take top-flight personnel to stay on top of the problems and to adjust with changing times.

ARIZONA

Southwestern Nitrochemical, as reported here last month had broken ground at Chandler for their $4,000,000 anhydrous ammonia plant. It developed that they had done so without a building permit, and there were difficulties with the county planning and zoning commission. These have been resolved. The permit has been issued. Construction is under way. The concern is the joint property of Southwest Agrochemical and First Mississippi Corporation.

CALIFORNIA

Valley Nitrogen Producers Cooperative, Helm, whose construction progress has been noted here since last Spring, has made its first shipment of anhydrous ammonia, marking the first production of fertilizer in the San Joaquin Valley. The plant, at capacity, will turn out 150 daily tons, and cost around $9,500,000. Future plans call for production of sulphate of ammonia, ammonium phosphate and phosphoric acid.

FLORIDA

The Florida Nitrogen Company has awarded a contract for the design and erection of a nitric acid plant to The D. M. Weatherly Company of Atlanta, Georgia. The new plant is to be erected in Tampa, Florida. Construction is already under way.

This is a part of the overall program of Florida Nitrogen for the production of nitrogen solutions and ammonium nitrate-limestone for the Florida market.

* * *

Virginia-Carolina has awarded the engineering and construction contract to Leonard Construction Co., Chicago for their contact sulphuric plant at Nichols.

The plant, which will use elemental sulfur as a raw material, will have a rated capacity of 500 daily tons and be capable of operating at 600-ton production. The plant will use Monsanto Chemical Company vanadium sulfuric acid catalyst. The acid will be used for additional production of phosphate rock, phosphoric acid and fertilizers.

Construction will begin immediately, Leonard said, with completion scheduled for June, 1960.

IDAHO

The Bunker Hill Company has announced that its multi-million dollar fertilizer plant will be constructed in Kellogg, home of the company's mining and major metallurgical operations. Construction on the first unit—a phosphoric acid plant—is scheduled to start immediately. It will be located just below the company's electrolytic zinc plant.

Both Kellogg and Kennewick, Washington, had been under consideration as the plant site and Bunker Hill had taken an option on a piece of property at Kennewick.

John D. Bradley, Bunker Hill president, said the major reason for selecting Kellogg was that sulphuric acid, was available there,—a by-product of their zinc plant.

Mr. Bradley said that the plant under construction would be confined initially to the production of phosphoric acid with a starting capacity of 130 daily tons. He emphasized that sufficient building area had been set aside for additional facilities to produce fertilizers.

Since late in 1958, **Dorr-Oliver, Inc.,** has been engaged in developing details of design and layout for the project.

* * *

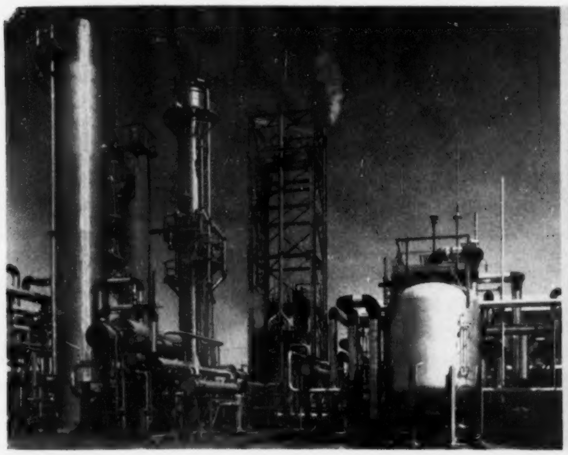
J. R. Simplot's 400 daily ton capacity sulphuric acid plant at Pocatello has been completed and started up.

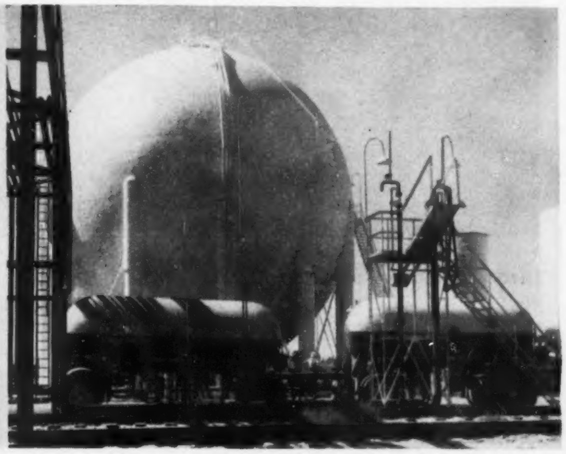
The new plant, which was designed, engineered and constructed by Leonard Construction Company of Chicago, uses recovered sulphur from local refineries, and Monsanto Chemical Company vanadium sulphuric acid catalyst. The sulphuric acid is used for increased production of wet process phosphoric acid which in turn is used by Simplot for the manufacture of phosphate fertilizers. Construction was started in December, 1958.

VALLEY NITROGEN IN PRODUCTION AT HELM, CALIFORNIA

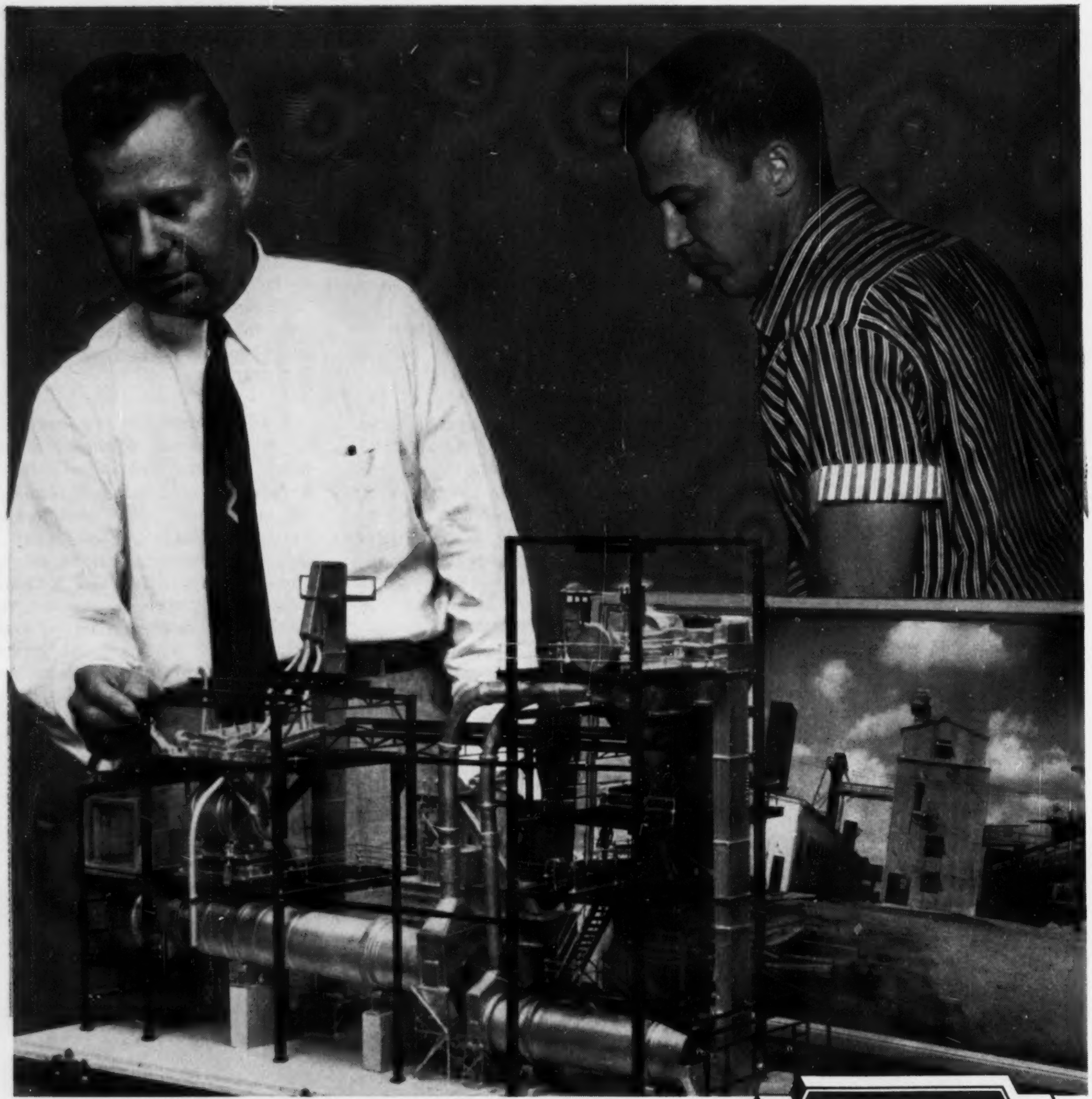
Ammonia Plant from left to right—Gas Purification Towers, Ammonia Synthesis Tower and Converter, on the new Valley Nitrogen plant.

Right, first truckload of ammonia shipped August 27, 1959, Loading Facilities and the Anhydrous Ammonia Storage Sphere.





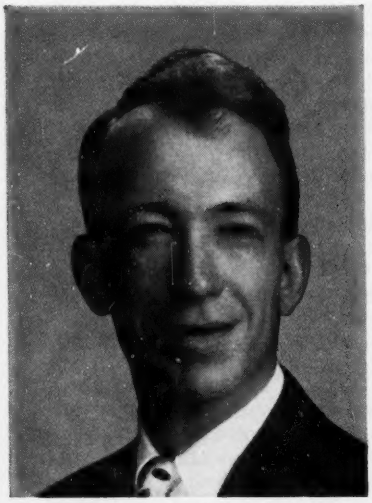
You Can Be Sure Of Up-To-Date Dependable Spencer Team Of



Spearheading the activities of Spencer's Tech Service team is Joe Sharp (left), Product and Marketing Manager for Spencer mixing liquids, shown examining a granulation plant scale model with Bill Yoakam of Spencer's Technical Department. Spencer Tech Service men are trained to assist mixers in engineering, formulation, plant design, granulation, preneutralization and personnel training. A call to Spencer will bring you the services of one of the Tech Service men shown on opposite page.

SPENCER ®

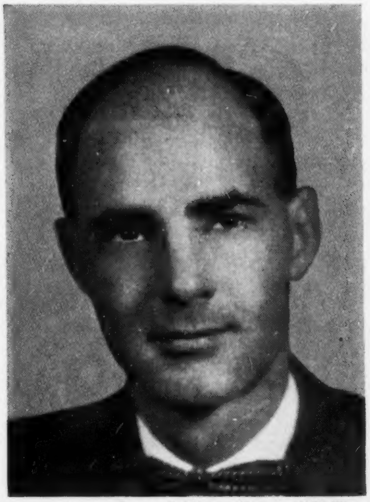
Technical Help From This Tech Service Experts:



Grant Marburger—Asst. Product and Mktg Mgr., Spencer mixing liquids.

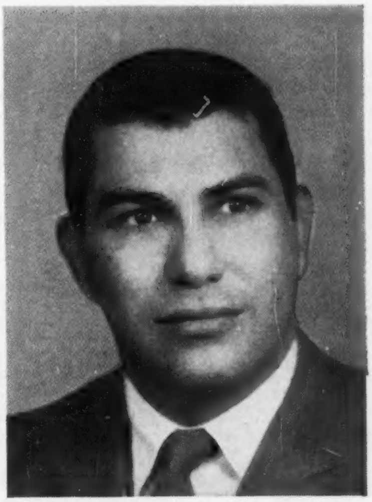
Lew Morgan—Serving mixers in Tenn., Ky., La. and Miss.

Floyd Miller—Serving Ala., N. Car., S. Car., Ga. and Fla.



Larry Lortscher—Minn., Iowa, N. D., S. D., Nebr., Wyo. and Mont.

John Naylor—Covering Wisc., Ill., Ind., Mich. and Ohio.



Paul Castagno—Mo., Kans., Okla., Colo. and Texas.

SPENCER CHEMICAL COMPANY

America's Growing Name In Chemicals

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Producers of **SPENSOL GREEEN** (Spencer Nitrogen Solutions)

Here is the former Kaiser-Fraser assembly plant which was recently purchased by Miller Products Company at Portland, Oregon, as reported to our readers last month. Part of a half-million expansion program, the new location will more than triple the firm's manufacturing area for their line of 165 farm and garden products.

ILLINOIS

Illini Phosphate, Champaign, has now taken in two thirds of the roundhouse they bought some time back and in which they started production earlier this year. During the Summer work was completed on the new office building. Under the direction of newly promoted manager, Albert E. Ball, the operation turns out pelletized fertilizer, available both in bags and in bulk. Leo T. O'Neill is president.

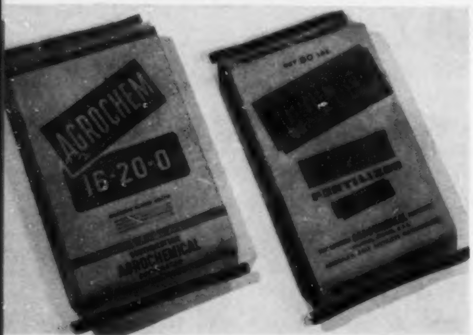
* * *

Farmer City Fertilizer and Chemical Co., Farmer City, has completed what is said to be a model bulk fertilizer plant. The plant is designed to tailor-make grades as required, and a soil-testing service is provided. The plant represents an investment of $40,000, being 40 by 100 feet of storage, plus 30 by 30 feet of mixing room, where a large concrete mixer is used in formulation of the fertilizer. Three spreader trucks are to be operated. The plant is capable of mixing 250 daily tons, and is able to store 1,000 tons.

An excellent example of cutting a customer's packaging costs has been reported by Union Bag-Camp Paper Corporation. The company recently recommended to Southwestern Agrochemical Corporation of Chandler, Arizona that it change both the design and construction of its 80 lb. fertilizer package. These changes have resulted in a saving to the customer of $300 on each carload order of multiwall bags.

As illustrated, the customer's old package, left design, had over 45% ink coverage on the front of the bag. Because there is an upcharge for front ink coverage over 45%, the redesign used less ink coverage but with more contrasting shades of ink. This gave the company a better looking package at a saving.

Further economies were made possible by the use of Union-Camp's "Sew-Strong" closure. This is a creped board tape firmly pasted to and sewn through the bag at the closures to reduce sewing line breakage. Reinforcing the bags at both ends in this manner made it possible to reduce the basis weight of the paper in the bag as well as its cost and further improved its merchandising value.



* * *

The Stark County Farm Bureau plans a new building to house a bulk blending plant, to be 83 by 44 feet, to store 450 tons. The plant is slated to turn out ten hourly tons—blended to soil-test specifications.

* * *

Wabash Valley Service Co. has added 5,000 feet of storage and mixing area and will blend to soil tests, offering farmers a complete fertilizer program. Morris Elden is manager of the Crayville firm.

LOUISIANA

Liquid Fertilizer and Feed Corp. has been chartered in New Orleans with capital stock listed at $100,000.

TEXAS

Consumer's Fertilizer plant at Henderson was damaged by fire to an extent estimated between $10,000 and $25,000. It is back in business by now.

UTAH

Amalgamated Chemical Co., Salt Lake City has been incorporated listing subscribed capitalization of $100,000. There will be no stock for sale in the firm, which holds 50,000 acres in potash permits in Southeastern Utah and Southwestern Colorado, according to the president, N. G. Morgan, Sr. Louis Buchman and Gus P. Backman are vice presidents; Orval W. Adams, treasurer; Virgil V. Peterson, secretary. These make up the board of directors.

INDIA

Amjore Pyrites Development Corporation will be set up as a subsidiary of the National Industrial Development Corporation for the production at Amjore, Bihar of sulphur, sulphric acid and fertilisers.

* * *

The Government has recommended that the 100,000 annual ton fertiliser plant proposed be located in Upper Assam as one of the first projects for the utilization of natural gas. The plant would have capacities of 75,000 annual tons of urea and 20,000 of ammonium sulphate.

KOREA

Honam Fertilizer Company will, when it is completed, operate the Najoo urea plant, an 85,000 annual ton operation. Honam is a 2,500,000,000 hwan stock company with 34,000 shareholders. It has been reported that collection of share installments have been slow, but the Commerce-Industry Ministry insists the project will be completed on time, by November of next year. West German concerns, represented by Lurgi, will supply equipment, 80% of which is due for delivery this year. 80 West German technicians are due to come in this month.

SPAIN

Export-Import Bank credits of $17,620,000 have been granted to two groups who desire to buy fertilizer equipment from the US. They are Refineria de Petroles de Escombreras and Abonos Sevilla, S.A. The two plants involved will add considerably to Spain's output.

Escombreras—which is jointly owned by a government agency and Compania Espanola and Caltex Oil —will put up a plant costing $35,000,000 with an output of 200,000 metric tons of ammonium sulphate, 70,000 of urea and 12,000 of anhydrous ammonia.

Abonos, which is jointly owned by Union Espanola, and Sociedad Iberica del Nitrogeno—both private companies—will build a $27,000,000 plant to produce 126,000 tons of complex fertilizer, 150,000 of superphosphate, 60,000 of ammonium nitrate and 5400 of sulphuric acid.

SYRIA

Adjacent to the petroleum refinery at Homs, the Ministry of the Interior of the Syrian Region of the United Arab Republic will build a $14,000,000 N fertilizer plant, planned to produce at least 100,000 annual tons.

TURKEY

Nitrogen Industries Ltd., a Turkish firm, has 85% complete a new plant in Kutahya, which is scheduled to produce 60,000 annual metric tons of ammonium sulphate, 50,000 of ammonium nitrate, 6,000 of concentrated nitric acid, 1,000 of crystallized ammonium nitrate and 1,000 of liquid ammonia. Badische Anilin und Soda Fabrik, West Germany cooperated in the construction.

Regional Safety Schools Gain Industry Approval

The Regional Accident Prevention schools, sponsored jointly by National Plant Food Institute and the Fertilizer Section of National Safety Council, got into high gear in August when the first three area sessions were held. Attendance at the Northeastern, Midwestern and Southeastern schools was improved over the 1958 enrollment, and interest in the sessions was at a key pitch.

The initial conference was held at Ithaca, N. Y. August 12-13, with Stratton McCargo of G.L.F. Soil Building Service directing the program. The Midwest school at Chicago followed on August 18-19, at National Safety Council headquarters with John E. Smith of Spencer Chemical Company in charge. Quensin S. Lee of Cotton Producers Association directed the school at Atlanta, Ga. August 27-28.

As over-all director of the Supervisory Training Program, W. C. Creel, safety director of the N. C. Department of Labor, guided the organization of the schools to see that effective instruction was planned and administered.

The instruction followed the successful format laid out last year when the regional schools were first held. Typical of the programs was the one at Atlanta, best-attended of the 1959 sessions held to date. The meeting got under way with a discussion of the purpose of the school and a description of the fundamentals of accident prevention. Based on a three-step plan of getting the facts, building the team, and solving the problems, the instruction followed a logical approach to accident control, incorporating a balanced group of essential functions adaptable to various sizes and types of operations.

First among the specific topics was housekeeping, covering ways of maintaining good order for safety, and listing the kinds of disorder leading to accidents. Practical methods of maintaining good order as a normal part of the production job were outlined.

Job instruction training was thoroughly covered, and dramatized by students took the part of a supervisor training a new employee. Using breakdown sheets for 28 specific jobs typical to the fertilizer industry, each student pretended to give a new employee a five-minute instruction for the job. As each operational procedure in the job was introduced, the hazards were pointed out along with the safety precaution to overcome each hazard.

The school freely employed the practice of breaking the students up into smaller discussion sections, each of which had a particular operation or problem under consideration. The discussion group later reported its findings to the entire school.

Safety materials, literature, visual aids and films offered by National Safety Council were frequently introduced into the program, and their part in a safety plan was stressed.

Discussion 66 was a new feature in the program, in which the entire group was broken up into small panels of no more than six men. Each panel took a safety problem from each of its members, then decided which it would submit as the group question. Questions were exchanged among groups, and the group receiving a question had a short period of time in which to come up with a practical solution for the problem.

This approach seemed to stimulate individual participation in the program, and questions and suggestions came freely from the students when the program returned to a full-group study of the hazards inherent in equipment and methods used in fertilizer plants.

Certificates of completion were issued to each participant at the close of the final session.

The style of program used in the first three meetings was very effective, and will be used in the two remaining schools: the Far West School to be held at Hacienda Motel, Fresno, California November 5-6 under direction of O. J. Chinnock, and the Southwest School to be held at Tropicana Motor Hotel, Pasadena (suburban Houston), Texas November 12-13, directed by Ansel I. Raney of Phillips Chemical Co.

George Pelton, chairman of the Fertilizer Section, National Safety Council, the schools: "Our objective in this program is to make training in accident prevention available to supervisors of every fertilizer plant in the United States. In turn, these key men will transmit safety training to the workers on their production lines. We hope in this way to drastically reduce the disabling injury frequency rate of the fertilizer industry throughout the nation."

Registration for the training schools is open to all members of the fertilizer industry, and the $20 registration fee includes two luncheons. Room reservations should be made direct with the motel. Advance registration fees should be submitted to (and checks payable to) National Plant Food Institute, 1700 K St., N.W. Washington 6, D. C.

Fertilizer Section Meets October 19-20

During the annual convention of the National Safety Council, the Fertilizer Section will meet, October 19-20 at the LaSalle Hotel, Chicago.

All representatives of the fertilizer industry who are interested in reducing hazards are encouraged to attend the meeting.

Careless Reporting Hurts Industry

Careless news reporting and interpretation of the Roseburg, Oregon explosion August 7 has not helped the fertilizer industry. Many news reporters and commentators referred to the material that was detonated by a dynamite explosion as 'ammonium nitrate fertilizer,' and many even drew a parallel to the 1947 Texas City incident. However, quick and positive action by National Plant Food Institute and Manufacturing Chemists' Association helped to minimize the unfair criticism of the fertilizer industry . . . an information circular pointed out that the material which exploded, causing a number of casualties and heavy property damage, was a blasting agent especially prepared *from* ammonium nitrate, and should not be referred to as 'ammonium nitrate fertilizer' or even as 'ammonium nitrate.'

Another statement by Dr. Melvin A. Cook, director of the University of Utah's Institute of Metals and Explosives, clearly pointed out in a press interview that ammonium nitrate which has been converted to an explosive by addition of carbonaceous compounds is an entirely different material from fertilizer grade ammonium nitrate. "If a few very simple precautions are followed, farmers and other users of ammonium nitrate fertilizer need have no fears about storing and using this excellent plant food," Dr. Cook added.

Take those big preseason savings on LION® E-2 now!

It's the one and only ammonium nitrate you can safely store for big spring markup and extra profit! Lion E-2 is free-flowing when you get it . . . free-flowing when you sell it . . . no matter how long you store it!

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Always stores . . .

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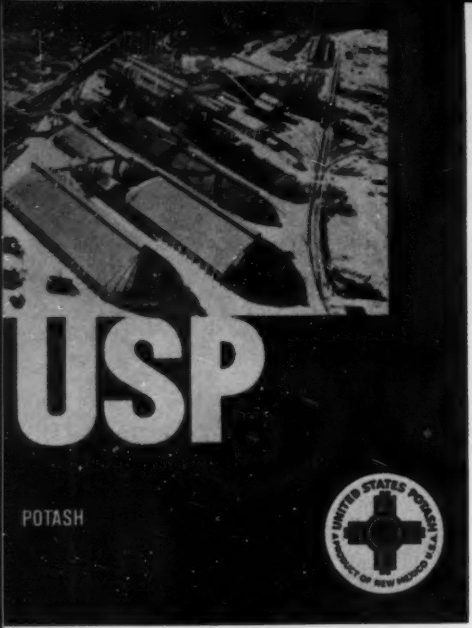
Photo taken at warehouse shows Lion E-2 stored in huge quantity (rows are stacked 27 bags high) with no danger of caking, shifting or sliding. Winter moisture won't cake Lion E-2 . . . not even the bags on the bottom. Lion E-2 won't cake in your storage area either . . . **we guarantee it.**

Order Lion E-2 Now . . . Order Big . . . Cash in Big!



FREE LITERATURE ON EQUIPMENT MATERIALS AND SUPPLIES

U. S. Potash Brochure

A new 4-page, 2-color brochure offered by United States Potash Company describes the potash products offered by the firm. Complete description, typical chemical analysis, and typical particle size analysis are covered for their line of standard, coarse and granular muriate of potash. For a free copy of this new brochure, circle Number 1 on CF's Information Service card, page 55.

New Masking Agents

P. Robertet & Cie of Grasse, France is offering practical long-lasting and completely effective masking agents for fertilizers and pesticides. These new products effectively odor-mask chemical odors and add their own fragrance to the products.

Free samples are available so you can conduct your own tests. Merely circle Number 2 on CF's Information Service card, page 55.

Mobile Air-Power Outfit

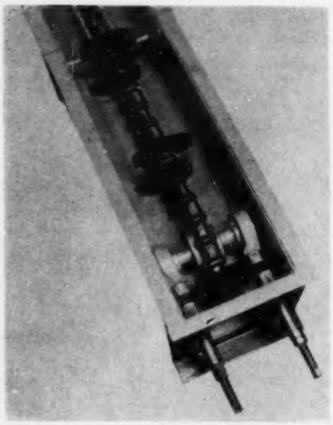
A new, all-purpose mobile air-power outfit for versatile, trouble-free air delivery has been announced by Campbell-Hausfeld Co. Known as the 'Tankmobile Jr.,' the low-cost unit features a heavy-duty Pressure Princess single-cylinder air compressor on a welded steel, safety pressure tested 7½ gallon tank.

Designed with a low center of gravity and semi-pneumatic 8" rubber tired wheels, Tankmobile Jr. remains balanced, easy to maneuver at all times.

Models are available with a ½ HP capacitor motor, or a ⅓ HP split phase motor. The capacitor motor unit has an automatic pressure switch to control tank pressure 60/80 psi. by running the motor only when needed.

A complete selection of accessories is available. An air chuck and 15 feet of ¼" air hose are standard equipment.

For complete details on the new unit, circle Number 3 on CF's Information Service card, page 55.



Flight Conveyor Bulletin

Folder 2813, a new four-page publication on Flite-Flo, a new fully enclosed, self-cleaning flight conveyor, has been released by Link-Belt Company.

This folder gives dimensions, capacities and other specifications on Flite-Flo units which can handle free flowing, granular, non-abrasive bulk materials in horizontal or limited inclined paths.

Flite-Flo conveyors consist of a single strand of combination chain carrying spaced flights operating within a covered conveyor U-trough. Material is fed into the trough and moves along its length in a uniform, continuous flow discharging at the end of the trough or at intermediate points.

Flights match the contour of the trough to insure effective cleaning action and to prevent contamination when handling several different materials, or grades of materials, successively in the same unit.

A copy of Folder 2813 can be obtained by circling Number 4 on CF's Information Service card, page 55.

Liquid Meter Bulletin

A new catalog of Niagara Industrial Liquid Meters, Bulletin 43, has been prepared by Buffalo Meter Company. It provides a new and simplified basis of selecting a volumetric meter for any given application and for any liquid that can be metered. Additional data not previously published is now included to facilitate the use of Niagara Meters in measurement of any of 200 liquids. The new catalog is available by circling Number 5 on CF's Information Service card, page 55.

Dust-Tight Bagholder

Dust-tight operation and increased productivity are claimed for a new automatic bagholder introduced by Richardson Scale Company.

Dust-tight closure is applied to the lip of the bag to prevent dust from flying up as material is discharged. Foot pedal air-operation leaves operator's hands free, thus stepping up productivity.

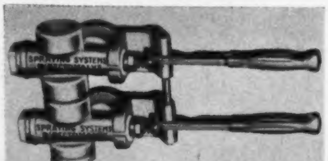
The new bagholder is adapted to semi-automatic Richardson G-17 gross bagger and the GA-17 gross bagging scale, both of which have oval bag spouts and are designed for filling either open-mouth textile or multiwall paper bags with capacities in the range 10 to 140 pounds.

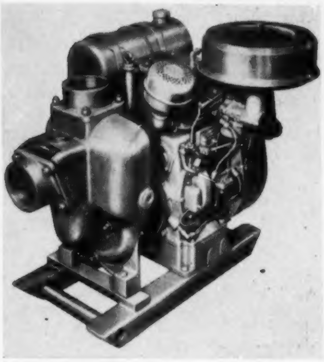
For further information, circle Number 6 on CF's Information Service card, page 55.

New Spray Control Valve

The latest Spraying Systems Co. development for farm spraying is the new DirectoValve. All parts of this new valve that are touched by chemicals are made of either nylon or stainless steel, providing maximum possible corrosion resistance to all farm chemicals and fertilizer solutions. The valves are supplied in one, two, three or four outlet port designs to meet any control need in boom or broadcast spraying. Shown here is a two-outlet-port DirectoValve for use with a two-section boom . . . to permit spraying to either side of the rig or to both sides at one time.

Design feature of the valve is that it provides a by-pass when closed, thereby protecting hose lines, fittings and pump from the effects of excessive pressure build-ups. The liquid continues to flow through the valve to the return line when the valve is closed. When any section of the valve is opened, or when all sections are opened the volume of liquid not required for outlet-port flow continues through the valve to the return line. Because of this feature, flow is uniform through the valve outlets, no matter how many sections are open or closed. For complete information in Bulletin 100, circle Number 7 on CF's Information Service card, page 55.





Extra Power Utility Pump

'High'r Pow'r' self-priming centrifugal 'Flomax' pumps of the utility type, newly added to its line of centrifugals, rotaries and self-primers by Marine Products Company, take their name from the use of an engine of greater power output than is normally used for this 3" pump.

Other characteristics of this pump are: 15,900 GPH and pressures up to 40 p.s.i., self priming, high capacity at high heads and having straight crankshaft-to-pump connection. The latter employs a standard straight keyed crankshaft instead of a special tapered, threaded shaft, permitting quick change of engines in the field or the rapid change-over of an iron to a bronze pump. To suit special corrosive conditions of fluids, the open adaptor construction peculiar to the MP design prevents fluids from contacting engine shaft or its bearing to cause rusting and subsequent failure.

For further details, circle Number 8 on CF's Information Service card, page 55.

Stainless Swing Joints

New stainless steel swing joints are now available from OPW-Jordan, for use as elbows in pipe lines wherever flexibility and rigidity are both needed. Easily withstanding tough, corrosive conditions and preventing product contamination, the Series 7400 stainless steel swing joints are available in 1¼" to 4" sizes in 17 different styles. Cast in 316 stainless steel and designed for 1,000 psi service; temperature determined by O-Ring seal. O-Rings available in a variety of materials: Viton, Buna-N, Neoprene, Butyl and Teflon. Complete engineering information, illustrations, specifications, chemical recommendations and prices in 12-page bulletin, F-8 and SRBC 52-59. For a free copy, circle Number 9 on CF's Information Service card, page 55.

Fertilizer Reodorants

Dodge & Olcott, Inc. has developed a new line of odorants called 'Fertomasks,' especially designed for the masking and re-scenting of fertilizer products.

Fertilizer manufacturers to submit a sample of their product; D&O will then select, through laboratory testing, the compatible 'Fertomask' and return treated sample, at no obligation, for customer's evaluation.

A brochure on this new 'Fertomask' line is available by circling Number 10 on CF's Information Service card, page 55.

Glassed Steel Tanks

Chemstor 'Glasteel' (glass inside, steel outside), designed for storing corrosive or sticky products, or those that cannot tolerate contamination, are described in a new bulletin available from The Pfaudler Co.

In 10,000 to 35,000 gallon capacities the tanks are claimed to cost less than stainless steel; in the thirty-thousand gallon range the cost of Chemstor is stated to be about 50% that of comparable stainless tanks. In 500 to 10,000 gallon capacities, Chemstors are widely used for corrosive storage and offer substantial savings through years of dependable corrosion-free service.

The bulletin includes descriptive data, a list of typical applications, and physical specifications of the tanks. Copies of Bulletin 975 may be obtained by circling Number 11 on CF's Information Service card, page 55.

New Power-Curve Loaders

A new conveying surface having at least three times the service life of previous materials is announced by Power-Curve Conveyor Company for its new car loaders and bag conveyors. The conveyors use spring steel belts to permit a continuous bag conveying surface which can be swung to right or left for high speed loading of box cars and trucks and for all other bag conveying service. A change in steel analysis and spring manufacturing technique is now used.

The new car loader is improved in many respects. The entire unit is stronger and simpler, capable of taking greater abuse. With a Power-Curve Loader installation one man, it is claimed, can load without aid at least two box cars an hour. For further details, circle Number 12 on CF's Information Service card, page 55.

Plastic Laboratory Ware

A new 24 page catalog is now available, covering polyethylene, polypropylene, polyurethane and polyvinyl plastic laboratory apparatus.

Laboratory ware made from these materials is lightweight and is highly resistant to chemical attack. Catalog H-459 illustrates and describes over 100 products. Technical properties are discussed in their relation to this development.

Available without obligation from the General Scientific Equipment Company, a copy of the bulletin may be obtained by circling Number 13 on CF's Information Service card, page 55.

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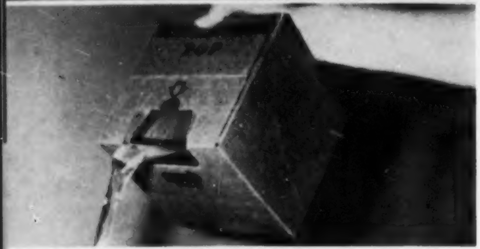


Liquid Fertilizer Container

'Cubitainer' is the name of a new liquid container which has been adopted by at least one liquid fertilizer manufacturer for distribution of small-package units. The unit consists of a tough, non-breakable semi-rigid insert of molded polyethylene plastic, which is packaged inside a corrugated carton especially designed for shipping and handling durability.

Hedwin Corporation, manufacturers of the new packaging unit, states that the complete container is only one-sixth as heavy as glass and one-half as heavy as metal containers of the same capacity. A convenient handle and spout permit easy pouring from the Cubitainer without removing the plastic insert from the corrugated container.

The Cubitainer, easy to assemble and fill with normal gravity or positive pressure methods, requires minimum space for storing and shipping; a standard 40-foot boxcar holds 19,000 one gallon Cubitainers, as compared with only 9600 one-gallon bottles. The manufacturer states that six repeated drops from tailgate height and six hours of vibration without breakage is normal performance for the Cubitainer.

The new liquid package is available in one-quart, one-gallon, five-gallon and fifteen-gallon sizes. For a brochure with complete details on the Cubitainer, circle Number 14 on CF's Information Service card, page 55.

New Sampling Pump

To meet the need for an easy method of sampling where contamination must be avoided and where highly-corrosive liquids are involved, W & W Manufacturing Company has developed a versatile, light-weight vacuum pump known as the "Golden Thief."

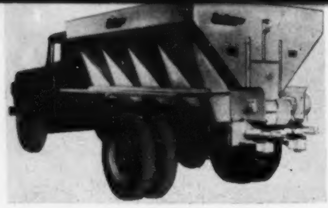
Lift of the pump is approximately 25 feet of water at sea level. Material passes through sanitary tubing from the sampling source directly to the sample container—never comes in contact with any part of the pumping unit.

Motive power is provided by the vacuum created in the sampling container on the up-stroke of the pump handle. Easy cleaning and low maintenance are additional advantages listed.

Model D "Golden Thief" is available in both stainless steel and aluminum. Since parts are interchange-

able, the pump can be furnished with stainless steel base and aluminum body or any combination to meet individual needs. The equipment fits neck-opening sizes from 22 mm., and can also be used for transferring materials to smaller containers.

Full details can be obtained by circling Number 15 on CF's Information Service card, page 55.



Single or Double Spinner Spreader

The Challenger, a PTO driven lime and fertilizer spreader, is available with single spinner and 18" conveyor or double spinners and a 24" conveyor. This choice of conveyors and spinners is unusual for equipment with such a low price tag as the Challenger's, according to officials of the Highway Equipment Company, manufacturers of the spreader.

The Challenger is a positive feed, self-unloading spreader. The conveyor and spinner system operates off the PTO. Body capacities range from 4.6 cu. yd. on the low cost 9' single spinner body to 8.8 cu. yd. on the 15' double spinner model.

More information including literature, complete specifications and name of nearest distributor may be obtained by circling Number 16 on CF's Information Service card, page 55.

New Polyethylene Bag

A new super-tough polyethylene film has been developed by Chippewa Plastics Company for its industrial bag, permitting a 40 per cent reduction in the gauge of the material for the heavy-duty bag. The new bag is designed for shipping and storing ammonium nitrate fertilizer, peat moss, and other materials requiring a high degree of moisture protection.

Presently identified as the Type B Chippewa Industrial bag, the new bag appears to have improved puncture and snag resistance despite its thinner walls, company researchers say. It incorporates a recently-developed seal that brings the strength of sealed areas virtually up the strength of the bag itself.

While field tests are in progress, the new Type B bag is available in limited quantity to prospective users for experimental purposes. Further information can be secured by circling Number 17 on CF's Information Service card, page 55.

New Automatic Baler

A new automatic baler, Series 50-100 Tol-O-Matic Baler, automatically loads sacks into paper baler bags or burlap shipping sacks. The machine is readily adjustable for different sizes of bags and bales.

The manufacturer, Tol-O-Matic, Inc., claims increased production and reduced packaging costs through the elimination of bag damage. The machine is easily operated by one man with no lifting. Additional savings are realized due to the fact that the machine shapes the filled bag so that it slides firmly into the shipping bag. This allows easier handling, palletizing and storage and the length requirement of the shipping bag may be reduced.

The machine is constructed of heavy steel fabrications and is pneumatically controlled. For full data, circle Number 18 on CF's Information Service card, page 55.

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Ammonia Plant—Designed, Engineered and Constructed by Lummus—Feeds Natural Gas or Butane

The St. Paul Ammonia Products, Inc. plant at Pine Bend, Minnesota has been operating continuously at rates above the design capacity of 200 tons per day of ammonia. Lummus' policy of close cooperation with the client at every stage was followed at St. Paul Ammonia. Lummus' extensive experience in plant design and construction have been effectively combined with the experience in plant operation of St. Paul Ammonia's capable staff in order to achieve a successful project.

In addition to producing anhydrous ammonia and ammonium nitrate solutions for the fertilizer industry, St. Paul also produces anhydrous ammonia meeting industrial specifications.

The Texaco Synthesis Gas Generation Process is employed to produce hydrogen for ammonia synthesis. Natural gas direct from the pipeline is normally used as the raw material. However, during the cold Minnesota winters the supply of natural gas is subject to interruption when preference is given to household users. The plant is designed so that at these times butane is used as the raw material.

The large compressors are gas-engine driven and use natural gas fuel except during the winter months, when propane from storage tanks is employed. The Lummus design fits the plant to the needs of the area and permits this sort of flexible operation.

This plant utilizes a hot potassium carbonate system for removal of CO_2, which helps reduce production costs.

Lummus acted as general contractors for the entire project which includes ammonia synthesis, nitric acid, and ammonium nitrate solutions units, and offsite facilities including utilities, tankage and product shipping.

Lummus has experience in design and operation of ammonia plants utilizing natural gas, heavy fuel oil, butane, and waste chlorine cell hydrogen. Capacities of Lummus built ammonia plants range from 60 to 300 tons per day.

In the past 50 years, Lummus has built over 800 plants to produce petrochemicals, chemicals and petroleum products. If your company is planning facilities of this kind, discuss your plans with Lummus.

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PEOPLE in the

American Potash Institute

Dr. Kenneth M. Pretty, of the Michigan State University Soil Science Department joined the American Potash Institute as Canadian director September 1, Dr. H. B. Mann, president of the Potash Institute, has announced.

Pretty

A highly trained specialist in soil nutrition problems, Dr. Pretty will serve all Canadian provinces—from Nova Scotia in the east to British Columbia in the west—administering the Institute's various services to the official agricultural advisors and fertilizer representatives of Canada. His offices will be in Burlington, Ontario.

Dr. Pretty will be going home, in a sense, for he is a native of Ontario, Canada.

IMC

International Minerals & Chemical Corporation has appoined Richard L. Chambless a marketing staff assistant in its Plant Food division, John D. Zigler, division general manager, announced.

Formerly a Plant Food division sales representative in Tupelo, Mississippi, Mr. Chambless will assist in preparing field sales programs, specializing in Rainbow, IMC's premium fertilizer.

Mr. Chambless joined IMC in 1957, after graduating from Mississippi State University where he majored in agronomy and agricultural economics.

Consolidated Mining

A. Wilkinson, Manager of the Chemical and Fertilizer Sales division of The Consolidated Mining and Smelting Company of Canada Limited, announces the appointment of A. V. Marcolin as an assistant manager of the division. Mr. Marcolin, who was transferred to the sales division in 1958 from the Company's operations in Trail, B.C., will be primarily responsible for offshore export sales.

Tull

Carl P. Smith, former advertising manager for J. M. Tull Metal & Supply Co., nitrogen solution systems suppliers, has become assistant branch manager of their Jacksonville, Fla. office. Foster L. Spain succeeds him as advertising manager, located at the firm's general offices in Atlanta, Ga.

Nitrogen Division

Appointments of Rein U. Mesdag and Dr. E. Peter Griffin as district agronomists for Allied Chemical's Nitrogen Division were announced by M. E. Hunter, vice president in charge of sales for the division.

They will assist Midwestern customers, farmers and universities with their soil problems and studies.

Mr. Mesdag, who succeeds Dr. Harvey J. Stangel in the Omaha, Neb. area, will service 11 Midwestern states from his headquarters in Omaha. Dr. Stangel is now chief agronomist for Nitrogen Division.

Dr. Griffin, who succeeds Dale Friday, will reside in Westerville, Ohio and cover the remaining eastern half of the Midwest.

Calspray

The appointment of Francis R. Uttermohlen as a California Spray-Chemical Corporation district agronomist in the Southwest has been recently announced jointly by Dr. Lemac Hopkins, district manager in the Southwest and Dr. M. H. McVickar, chief agronomist of California Spray-Chemical Corporation. Mr. Uttermohlen joined the company on December 1, 1955. He will be working out of the Phoenix, Arizona District Office.

Farmers Union

C. K. Harmison has been named director of the feed and fertilizer division of the Farmers Union Central Exchange, succeeding Frank Calvin, who has retired.

Velsicol

Bernard H. Lorant, recently named as assistant to the president of Velsicol Chemical Corporation, has been assigned full responsibility for the company's over-all research and development activities. The company pointed out that Mr. Lorant will also continue in charge of the lgeal and patent functions.

North Florida AES

Willis H. Chapman has been appointed agrononist in charge of the North Florida Experiment Station.

Dr. J. R. Beckenbach, director of the Florida Agricultural Experiment Stations says Mr. Chapman is assuming the position vacated by W. C. Rhoades, who recently requested relief from administrative duties.

U of Missouri

George E. Smith, a faculty member of the University of Missouri College of Agriculture, has been named chairman of the College's Department of Soils, effective September 1, John H. Longwell, dean of the College, has announced.

Smith

Dr. Smith replaces W. A. Albrecht, who has been department chairman since 1938, has reached mandatory retirement age and was made professor emeritus of soils at the University's June commencement.

Price

W. H. Price, general manager of Swift & Company's Agricultural Chemical Division and a member of National Plant Food Institute's Midwest regional advisory committee, has been appointed to the Illinois Feed and Fertilizer Laws Commission by Governor William H. Stratton. The commission was set up by the Illinois legislature this year to study the state's feed and fertilizer laws and make recommendations for new legislation or for more effective enforcement of existing laws.

Northwest Coop

William Jones has succeeded A. H. Roffers as manager of Northwest Co-op Mills in St. Paul, Minn. Mr. Jones has run the inter-regional co-op's fertilizer operations the past three years.

Kansas Extension

The first two appointments in agronomy extension work at Kansas State University were made last month by reassignment of two staff members, it was announced by Harold E. Jones, director of extension, and R. V. Olson, head of the agronomy department. Robert Bohannon will be responsible for soil fertility and soil testing in extension, and will head the soil testing laboratory and research for the experiment station. Howard Wilkins will work in the area of crop improvement and crop performance tests, along with other duties.

INDUSTRY

V-C

Virginia-Carolina Chemical Corporation has added a second agronomist to its home office staff.

Blizzard

Paul Blizzard, formerly a V-C fertilizer salesman out of Greensboro, N. C., will assist the company's head agronomist, Myron Keim. Mr. Blizzard recently completed requirements for a master's degree in agriculture at North Carolina State College.

Smith-Douglass

R. J. (Dick) Fosdick has been named assistant sales manager for mixed fertilizers in the Southwest, Smith-Douglass fertilizer sales manager P. T. Smith announced this week. Fosdick, who has managed a sales territory in Cedar Rapids, Iowa, has transferred to Texas City, Texas, where he will assist Southwestern sales manager J. H. Lanier.

Mr. Fosdick joined Smith-Douglass in 1952.

H. J. Baker & Bro.

Franklin Wheeler has joined the New York office of H. J. Baker & Bro., chemical importers and exporters, to assist in the development of new markets and general product promotion.

Wheeler

Prior to joining H. J. Baker & Bro., he was for three years sales manager for Allied Chemical International Corp.

Mr. Wheeler spent three years with Wells Fargo of Cuba, and six years in the specialty division of American Agricultural Chemical Co.

Consumers Coop

Howard Cowden, president and general manager of Consumers Cooperative Association since it was organized 30 years ago, has stepped down as manager.

Bruce McCully, CCA's first assistant general manager since 1954, will succeed him. Mr. Cowden will continue as president of the regional farm supply co-op and as CCA's chief administrative officer. In the latter job, he will give his attention to long-range planning, civic affairs, and several national and world organizations. He is 66.

Raymond Bag

D. F. Wicks, general sales manager of Raymond Bag Corporation, Middletown, Ohio, a division of Albemarle Paper Manufacturing Company, announced the following changes in Raymond's sales organization:

Roberts

Bacon

R. G. Roberts, Jr. has been appointed to the newly created position of assistant sales manager. He was formerly connected with the Chicago sales office, and will now be located in Middletown.

Stevens

Greene

T. H. Bacon, formerly eastern district sales manager, has been named eastern regional sales manager. He will continue to be located in New York City.

The newly appointed western regional sales manager is R. J. Stevens, who was formerly midwestern district sales manager. He will continue to be located in Chicago.

J. M. Greene of Raymond's Louisville office has been appointed central district sales manager.

USDA

K. D. Jacob, former chief of Fertilizer Investigations Research Branch, has been appointed to serve as special assistant to Cecil H. Wadleigh, director of Soil and Water Conservation Research Service. His extensive experience in fertilizer technology research and diagnosis of research problems qualifies him uniquely to provide technical, scientific and administrative advice to the director and his staff in planning new research and analyzing accumulated fertilizer technology research data.

Jacob

William L. Hill, former head of the Fertilizer Materials Section, succeeds Dr. Jacob as chief of the Fertilizer Investigations Research Branch. Mr. Hill has been engaged in a comprehensive program of research concerned with improving the nature of economic fertilizer materials.

U. S. Borax

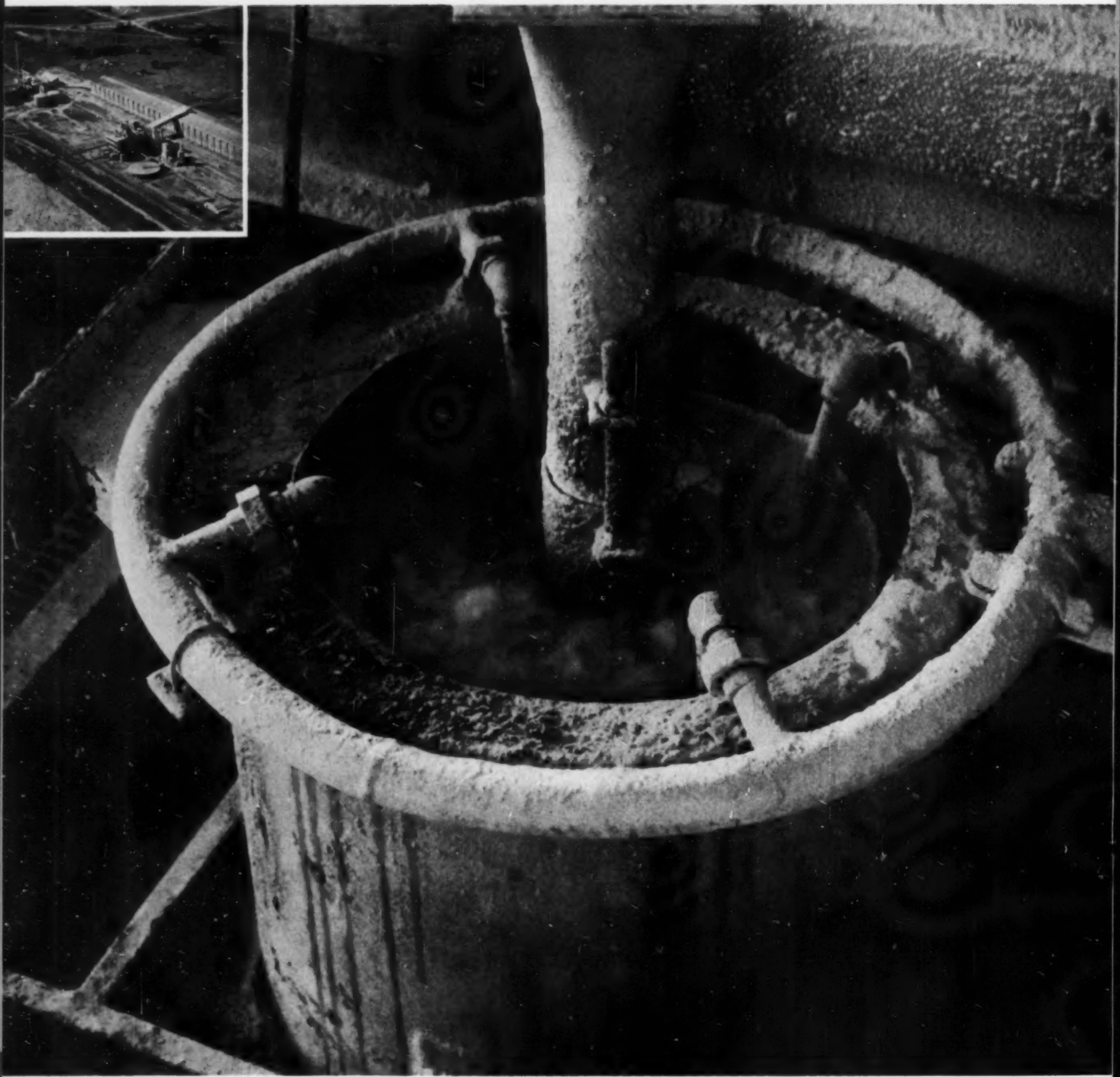
Dean R. Gidney has resigned from the United States Borax & Chemical Corporation, according to an announcement by James M. Gerstley, president.

Mr. Gidney's resignation followed the realignment recently announced by the company in which the division system was abandoned in favor of five functional departments. (See Changes, page 61.)

In expressing regret at the loss of Gidney's valuable services, Mr. Gerstley said the change in the management structure provided for only one top echelon sales and marketing position. Appointed to this post was J. F. Corkill, who had joined the company some years earlier than Mr. Gidney.

Nicholas J. Kockler has been named corporate director of US Borax & Chemical public relations. Phillip T. Maddex has been named chief engineer, with Arthur J. Weinig, Jr., as assistant chief engineer. Dr. Robert F. Rollsten has joined US Borax Research Corp as a research chemist, and Edward D. Wurster has been appointed to the same staff's agricultural research and development department.

Appointment of Dr. Siegfried Muessig as chief geologist for US Borax is announced by Mr. Gerstley. Dr. Muessig joins U. S. Borax from the mineral deposits branch of U. S. Geological Survey.



INDUSTRY CHANGES

U. S. Borax

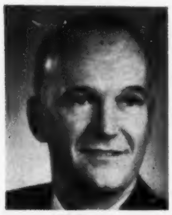
In a move to meet the requirements of its growing business, the United States Borax & Chemical Corporation has announced plans for a realignment of its management structure.

Key feature of the program is the establishment of five functional departments to take maximum advantage of the specialized abilities of key personnel. The new functional structure replaces a divisional organization based on product lines, said James M. Gerstley, president.


Gerstley


Reimer

The new corporate structure includes five vice presidents who will serve under Hugo Riemer, executive vice president. They are J. F. Corkill, former vice president and general manager of the Pacific Coast Borax Division, who will be in


Edgar


Corkill

charge of industrial and agricultural marketing; R. T. Edgar, former vice president for production in the Pacific Coast Borax Division, who will be in charge of production of all company products; D. V. Parker,


Taylor


Steel

who will continue in charge of 20 Mule Team Products marketing; R. F. Steel, former vice president in charge of finance and administration, who will become treasurer and head the administrative department; and Dr. D. S. Taylor, former vice president and general manager of the U. S. Borax Research Corp., who will head the technical department. W. A. Ackerman will continue as secretary of the corporation.

Smith-Douglass Merger

Smith-Douglass Company, Inc., announced Sept. 15 that its merger with Smith Agricultural Chemical Company was consummated and became effective on September 15. As the surviving corporation, Smith-Douglass acquires additional operating plants at Columbus and Carey, Ohio; Saginaw and Holland, Michigan; and Indianapolis, Indiana.

W. F. Farley, formerly president of Smith Agricultural Chemical Company, has become assistant to J. H. Culpepper, vice president of the fertilizer division of Smith-Douglass Company.

Smith-Douglass maintains home offices in Norfolk, Virginina, while Smith Agricultural Chemical Company has been headquartered in Columbus, Ohio.

Smith-Douglass operates fertilizer manufacturing plants in Albert Lea, Minnesota; Streator, Illinois; Wilmington and Kinston, North Carolina; Danville and Norfolk, Virginia; and Texas City, Texas. It mines phosphate rock at Plant City, Florida, and produces phosphorus feed supplements at both Plant City and Texas City. Natural organic nitrogen is produced in Granite City, Illinois, and a second Norfolk, Virginia plant. At Houston, Texas, the company has an anhydrous ammonia facility. Phosphoric and sulfuric acid and potassium silicofluoride are produced at Streator, Illinois, Norfolk, Virginia, and Texas City, Texas.

Barnard & Leas

Barnard & Leas Mfg. Co., Inc. of Cedar Rapids, Iowa, U.S.A. have just announc ' the appointment of Euram S.A., 10 Place de la Gare, Lausanne, Switzerland, as their exclusive sales representatives for Western Europe. Euram S.A. will be responsible for the sale of the liquid fertilizer processing equipment manufactured by the chemical plants division of Barnard & Leas and other items. Mr. Pierre Guberan, Director of the newly formed company, Euram S.A., has just completed an extended visit at the Barnard & Leas factory in Cedar Rapids, Iowa.

Spencer Announces Changes

Changes in top production and sales management within its Agricultural Chemicals division have been announced by Spencer Chemical Company. They follow the recent election of new Spencer officers which saw John C. Denton, formerly Vice-President — Agricultural Chemicals, become company president.

The changes, as announced by Byron M. Kern, new vice-president —Agricultural Chemicals, are as follows:

Jack E. Straub, formerly assistant to the vice-president, becomes general manager of production; S. Ray White, formerly sales manager, becomes general sales manager.


Best


White

Francis E. Best, formerly North Central district sales manager (Chicago) moves to Kansas City to become sales manager; W. Dave Van Aken, formerly Midwest District sales manager (Kansas City), moves to Chicago to become North Central district manager; Ralph Willits, formerly Minnesota Sales Representative, moves to Kansas City to become Midwest District Manager.


Straub

Kenneth A. Keith, formerly manager of Agricultural Market Research, who died Sept. 9, was to become manager for a new district sales office being established at Omaha, Nebraska.

Messrs. Straub, White, Best and Willits will be located in Spencer's General Office in the Dwight Building, Kansas City, Missouri.

Davidson-Kennedy

Davidson-Kennedy Associates Company have announced through M. Rex Wingard, vice-president,

that Horrall Harrington has been appointed manager of commercial development.

In his new duties Mr. Harrington will handle sales of complete chemical and general purpose process facilities as well as investigation and coordination of industrial development and lease-back arrangements.

Mr. Harrington joins D-K-A from Miller-Davis Company, where he was Director of Special Sales. He has had many years of previous engineering and business experience with Blaw-Knox Company and H. K. Ferguson Company.

Chase Bag Moves Executive Offices

The Chase Bag Company moved its executive offices on October 1 to the recently completed 22-story office building at 355 Lexington Avenue in New York. Chase Bag will occupy the entire 13th floor and half of the 12th.

F. H. Ludington, president of Chase, announced that the new offices will provide added space to handle the increased packaging requirements of Chase customers. The firm maintains 14 plants and 32 sales offices throughout the country.

Summers Acquires Chemgro, Inc.

James E. Totman, President of Summers Fertilizer Company, Inc. has announced acquisition of Chemgro, Inc., Fergus Falls, Minnesota. The purchase involved the plant, equipment, inventory and trade mark. The operation will be under the general direction of W. A. Stolt, Summers' general manager of operations in the Dakotas. It will be designated as Chemgro Division of the Summers Fertilizer Company, Inc., Baltimore, Maryland and supplement the operations of Summers' plants at Sioux Falls, South Dakota and Grand Forks, North Dakota.

Chemgro was organized in 1955 with Messrs. B. F. Wolford as president & general manager and G. R. Lancaster, treasurer. The present management will become affiliated with Summers as co-managers of the local operation.

Chemgro manufactures double strength and complex fertilizers. Its equipment consists of the latest design, built around a T.V.A. Continuous Ammoniating unit, with an annual capacity of 15,000 tons.

IMC Buys Plant In Oklahoma

The plant food division of International Minerals & Chemical Corporation has purchased a fertilizer plant in Bartlesville, Oklahoma, extending its operations into Kansas, and improving its service in Oklahoma and northern Arkansas.

John D. Zigler, division general manager, said modernization of buildings and machinery, and addition of new equipment will make the plant a leading producer of mixed fertilizers in the southwest. It will specialize in production of Rainbow, IMC's premium plant food. The plant was formerly operated by Moneka Farm Stores, Inc., and has been inactive during the past year.

Sales from Bartlesville to western sections of Oklahoma and Kansas, will be handled through the Plant Food division district sales office in Ft. Worth, Texas. Eastern Oklahoma, eastern Kansas, and northern Arkansas are assigned to the Division's district sales office in Texarkana, Arkansas.

Chemical Packaging St. Regis Subsidiary

St. Regis Paper Company announces that Chemical Packaging Corporation, which it recently acquired through an exchange of stock, will be operated as a subsidiary specializing in the sale of multiwall bags and packaging equipment to the fertilizer industry east of the Mississippi River.

Richard Heard, president, of Chemical Packaging Corporation, will continue in that capacity, which will assure continuity of operations while assisting in the smooth merger of the packaging group into St. Regis. In this regard, Mr. Heard will work directly with Bernard W. Recknagel, vice president and general manager of the St. Regis Flexible Packaging Products sales division.

Donald F. Stewart, vice president and treasurer of Chemical Packaging Corporation, will continue his present responsibilities including financial and accounting affairs for the corporation.

The Savannah, Georgia, and Louisville, Kentucky, plants of Chemical Packaging Corporation will become a part of the St. Regis Eastern Bag Plant group.

Sales of Chemical Packaging Corporation will be under the overall direction of Charles A. Woodcock, director of Eastern operations, Flexible Packaging Products sales division. William S. Doolan, sales manager of Chemical Packaging Corporation, will work directly with Mr. Woodcock to maintain the specialized attention given to fertilizer bag customers and coordinate with regional offices of the Eastern area sales group of the Flexible Packaging Products sales division.

Consumers Cooperative Buys Farmers Chemical

The Consumers Cooperative Association of Kansas City, Mo., has bought a controlling interest in the plant of the Farmers Chemical Company from the Missouri Farmers Association for about a million dollars.

The plant is located on a 35-acre tract six miles west of Joplin, Mo., and makes ammonium phosphate fertilizer.

Before the sale the M.F.A. owned 60 per cent of the plant and consumers owned 40 per cent. Under the new arrangement Consumers owns 75 per cent and M.F.A. 25 per cent.

Du Pont Consolidates Marketing Effort

Sales of Du Pont agricultural and industrial products made by the company's Industrial and Biochemicals department will be consolidated under two new groups to strengthen marketing efforts and provide better service to customers.

The Industrial Chemicals division will be responsible for the sale of all industrial chemicals formerly handled by the Grasselli Chemicals and Polychemicals departments. The Biochemicals division will be responsible for all agricultural products formerly handled by these departments as well as sales of antifreezes.

Thomas H. McCormack, has been appointed general director of sales for the department. John H. Daughtridge has become director of sales of the Industrial Chemicals Division and William B. M. Tracy, Jr., is assistant director.

Union Special Makes Sales Office Changes

Union Special Machine Company, Chicago, announces sales and service coverage direct from Chicago will be extended throughout Illinois, Indiana, Ohio, Michigan, the northern half of Kentucky, and the southwestern half of West Virginia.

John F. Lux, headquartering at Detroit, will cover the State of

Changes...

Michigan with the exception of the Upper Peninsula; Ray E. Hinton at Cincinnati will continue as representative covering the central Ohio territory; the northern half of Kentucky and the lower two-thirds of the state of Indiana will continue to be handled by Barney L. Rogers stationed at Louisville. W. Dale Speer who has represented Union Special in northern Ohio is being transferred to Pittsburgh. Announcement of a replacement for Mr. Speer will be made shortly.

In order to give adequate support to the expanded Chicago District, Fred L. Koehler has been named assistant manager to Orville Ullrick.

Richard H. Marsh is being transferred from Pittsburgh to Chicago to succeed Mr. Koehler in that territory. To further augment the Chicago District staff, E. A. Schlect has been named Office Manager for Mr. Ullrick.

The Philadelphia district territory has been extended to the Pennsylvania-Ohio line and dipping south to include the northern third of West Virginia and in New York will include a few counties in the extreme western end of the state. This is the territory formerly covered by Richard Marsh and which will now be handled by W. Dale Speer for the Philadelphia office.

The Atlanta district territory has been expanded to include all of the state of Tennessee and the southern half of the state of Kentucky. The territories covered by William J. Brauch, headquartering at Nashville, Tennessee, and Horace E. Clinard, Knoxville, Tennessee remain unchanged and will now be served direct from the Atlanta district office.

Edward E. Smith who has been serving as a junior representative has been appointed to a full representative and is stationed at El Paso, Texas where he will cover New Mexico and counties in West Texas from the border to mid-way up the Panhandle.

In Canada, Clyde F. Amey has been named district manager to handle the company's Canadian business and will continue to headquarter at Montreal. Sam J. Storey who has been the Canadian district manager has been named to a supervisory position at Toronto.

Replacing Clyde Amey in the sales territory which he formerly served will be Arthur Groleau.

MEETING BRIEFS

Phosphate-Soil Reaction Symposium

The Tennessee Valley Authority and the Southern Regional Soil Research Committee (Fertilizer Evaluation Work Group) will sponsor jointly a symposium on the chemistry of phosphate-soil reactions at the TVA Fertilizer-Munitions Development Center, Muscle Shoals, Alabama, January 27-29. The symposium will occupy the morning sessions on the first two days. The final session on Friday morning, January 29, includes reviews of cooperative work with states, with emphasis on fertilizer salt effects on germination and growth and on studies with fused potassium phosphates. Afternoon sessions on January 27 and 28 will be devoted to planning, involving only the sponsoring groups and cooperating states. Tours of TVA's fertilizer-munitions research facilities will be available for all in attendance.

Speakers for the phosphorus symposium will include Drs. P. R. Stout, University of California; M. L. Jackson, University of Wisconsin; N. T. Coleman, N. C. State College; Sterling Olsen, A.R.S., Colorado State University; M. Peech, Cornell University; M. Fried, A.R.S., Beltsville, Md.; and TVA researchers.

Soil scientists and commercial representatives interested in technical research in these fields are invited to attend. For information on hotels, program, etc., contact George Stanford, Chemical Engineering Building, TVA, Wilson Dam, Alabama.

Midwest Meeting February 11-12

The annual Midwest Agronomists-Industry meeting is scheduled to be at the Edgewater Beach Motel, Chicago, February 11-12.

Georgia P. F. E. S. Theme "Our Farmer Customers"

The Georgia Plant Food Educational Society will meet in Athens at the U. of Georgia Continuing Educational Center January 14-15. The program theme is "Our farmer customers—today and tomorrow." If accommodations can be found, wives will be invited—but for the time being this is not possible. Reservations at the Center should be made before long to be sure you get to stay at this fabulous place.

S. C. Society November 9

The South Carolina Plant Food Educational Society will hold its annual meeting November 9 at the Clemson House. A. B. Everett, secretary-treasurer can be reached at 615 Saluda Ave., Columbia, S. C.

Yakima Conventioneers to Tour Calspray and Phillips

The annual convention of the Pacific Northwest Plant Food Association, meeting in Yakima October 14-16 will include in their agenda a bus trip to Kennewick to see the Phillips and Calspray plants there. The program had not been released as we went to press—but this group is noted for its constructive sessions, as well as good times between.

Bankers to Study Fertilizer Industry

Northern California bankers and professional farm managers are attending a one-day tour of the California fertilizer industry and will be briefed on the key processes in the production of Nitrogen, Phosphate and Potash fertilizers on Wednesday, October 7, according to Dr. Richard B. Bahme, Western Regional Director of the National Plant Food Institute which is sponsoring the tour and school in cooperation with the University of California.

Minnesota Meeting Sets Things Straight

When the summer nitrogen conference was held on the St. Paul Campus of the University of Minnesota, J. M. McGregor, soils scientist, set the record straight on the uses of N. Liquid ammonia, ammonium nitrate, urea and other forms are equally effective when properly applied, he told the delegates. He also said that Iowa tests show that when corn is raised on land that produced alfalfa the year before, the alfalfa supplies the corn production equivalent of about 25 pounds of N per acre.

And A. C. Caldwell, another U. of Minnesota soils man emphasized that N pays well, but pays best when used with other plant nutrients. Have soil tested first—then put on what the test shows, he said.

Fertilizer, Seed Clinics Set for Illinois

A series of Seed and Fertilizer Clinics has been slated for eight Illinois cities in October and November, it was announced by Dr. Samuel R. Aldrich, professor in soil extension of the University of Illinois.

Fertilizer companies doing business in Illinois are invited to send their agronomists, area salesmen and local dealers to the meetings. The clinics are sponsored jointly by the Illinois Seed Dealers Association, the National Plant Food Institute, the Illinois Fertilizer Industry Committee and the University.

Dates and locations of the clinics are: Oct. 12—Urbana—Golf & Country Club; Oct. 19—Springfield—State Fair Grounds, Ill. Building & Clara's Restaurant; Oct. 21—Effingham—Country Club; Oct. 22—Benton--Country Club; Nov. 3—Macomb—West Student Prince Restaurant; Nov. 4—Kewanee—Hotel Kewanee; Nov. 5—Rockford (Location to be announced); and Nov. 6—Joliet—Louis Joliet Hotel.

The Urbana clinic will run from 10 a.m. to 3:30 p.m. The Springfield and Effingham meetings will be timed from 3 p.m. to 9 p.m.; and the Benton, Macomb, Kewanee and Rockford clinics from 2:30 p.m. to 9 p.m. The Joliet clinic is scheduled from 9 a.m. to 4 p.m.

The program for the various clinics is designed to provide information on the newest developments in plant food use, fall fertilizer application and other timely subjects. Among speakers will be Dr. Aldrich and Prof. W. O. Scott, extension specialist in crops.

Minnesota Launches Soil Testing Campaign

"Minnesota's Fall Soil Sample Roundup"—a campaign to promote fall soil testing—was launched in the state in early September.

University of Minnesota soils men, county agents, the fertilizer industry and farmers themselves are cooperating to make the campaign a success.

According to Lowell Hanson, University extension soils specialist, the campaign has two main purposes: first, to get more farmers to have their soil tested, and, second, to get more test samples taken in the fall.

The Farmer magazine, St. Paul, will donate a trophy to be presented to the county with the best fall soil testing record.

Texas Soil Fertility Program

An intensified soil fertility program to be launched this fall and patterned after the highly-successful effort in Georgia, were announced by Dr. John E. Hutchinson, director of the Agricultural Extension Service, Texas A & M.

Some 12 counties in Northeast Texas, the Gulf Coast, and the South High Plains will be enrolled in the program.

Considerable financial, material, and personnel aid will be provided by the National Plant Food Institute and the American Potash Institute will add further support.

NPFI Helps On Arizona Brochure

"Arizona Farmers Profit from Fertilizer," a new brochure published by the Arizona Bankers Association in cooperation with the University of Arizona is now off the press, according to Dr. Richard B. Bahme, Western regional director of the National Plant Food Institute, who worked closely with these groups in preparing the 20-page booklet.

The International Scene

BRAZIL

Large Fertilizer Imports

Brazil's expansion of agricultural production and its shortage of phosphorus and calcium call for large imports of chemical fertilizers. Foreign purchases totalled 548 thousand tons in 1957, valued at over US$32 million—Rio de Janeiro.

CANADA

English-Dutch Expansion

English-Dutch fertilizer interests with world-wide operations are continuing their expansion in Canada.

Fisons Ltd., England, and Albatros Superfosfaatfabrieken, N.V., Holland, who already own International Fertilizers Ltd. (with plants at Saint John, N.B. and Wolf's Cove, Que.) have now acquired Hy-Trous Co. of Canada, a family-owned, Cornwall, Ont., fertilizer maker.

A new company, Hy-Trous Co. of Canada 1959 Ltd., has been formed to take over the business.

CUBA

Castro Seeks Fertilizer Plant

According to the chief of his Agrarian Reform Institute, Castro is feeling out a group of American investors with the idea of getting them to build a fertilizer plant in Cuba. Said chief hastened to explain to the Americans that the recent expropriation of US-owned sugar fields was still being "negotiated" and that people with plants there need not worry about them. The new laws forbid foreigners to own land for agricultural purposes.

DENMARK

Potash Deposits Worked

Exploration of potash deposits discovered 10 years ago in North Jutland, Denmark, during oil prospecting, has begun. If the findings are promising preparations for mining are expected to be made. Denmark imports about 300,000 metric tons of potash fertilizers annually from European sources. Exploitation of domestic potash deposits would not only eliminate the need for such imports but would provide employment in a distressed labor area.

ENGLAND

Fisons Acquires Liquinure

Fisons has reached the final stage in negotiations to acquire the world rights to the registered trade mark Liquinure and Liquinure formulations, from Dr. L. Blass, and in addition its manufacture and distribution from Ulvir. This change will become effective from October 1, 1959, when a new subsidiary company. Liquinure Sales, will continue unaltered the Liquinure business at the same address.

KOREA

Eliminates Japan as Source

The Government has instructed Ambassador to the United States You Chan Yang to negotiate with U.S. aid authorities in Washington for an arrangement under which Korea can refuse to buy $2,950,000 worth of urea fertilizer from Japan.

Japan entered the lowest bids for supply of the fertilizer in a recent bidding under the ICA program.

SOUTH AFRICA

Notes Unbalanced Position

The recent opening of the £2½m. plant of Fisons (Pty.) at Sasolburg, in the Orange Free State, highlighted South Africa's unbalanced fertilizer position, namely the insufficient supply of nitrogenous and potassic fertilisers as compared with the production of superphosphate.

Production of fertilizer materials in 1958 is estimated to have included 110,000 short tons of phosphate rock, 750,000 tons of superphosphates, and 64,500 tons of ammonium sulfate. Superphosphate has been produced by two plants, but the third is scheduled to start operating in 1959. The urea plant under construction at Moderfontein is expected to be completed in 1960.

THAILAND

Wants Fertilizer Plants

Fertilizer industry executives in the U. S. are being invited by the government of Thailand to investigate the possibility of establishing chemical fertilizer plants in Thailand under a newly developed program designed to encourage foreign investors, according to Thailand's foreign minister, Thanat Khoman, who visited West Coast cities in mid-September for a series of interviews with businessmen. Khoman was on his way to Washington, D. C., to attend a SEATO conference, at which world trade problems were to be discussed.

Chemical fertilizer plants, such as ammonium sulfate, with a daily capacity of not less than 50 metric tons, are sought by the Thai government, Khoman said. There are at present no chemical fertilizer plants in Thailand, and imports are heavy.

Among inducements offered foreign investors are income tax exemptions, exemption or reduction on import and export duties, lowering of immigration quotas for skilled workers, guarantees of no competition with authorized industries from the state and permission to remit abroad in foreign currency for dividends, profits, interest and capital or principal. Local labor rates are quoted at about 20 cents an hour.

An investment guarantee between the United States and Thailand has been concluded, Khoman said, and the United States has established government insurance against war and currency devaluation in Thailand.

TURKEY

Raw Material Shortages

The Gubre Fabrikalari superphosphate plant near Iskenderun has been operated only sporadically in the past 6 years because of raw material shortages. Both sulfuric acid and phosphate rock are imported, and import restrictions have limited supplies. The plant has an annual capacity of 100,000 tons, but the highest production of any year (1955) was less than 50 percent of this figure. Most of the superphosphate produced is used on sugar beets, citrus, and rice crops. The market exceeds production, but the supply outlook is not promising. Although a new economic program was instituted by the Government in August 1958, imports of raw materials for superphosphate production received no preference.

International Minerals To Hold New Series Of Sales Training Clinics

International Minerals & Chemical Corporation will conduct a new series of sales training clinics this fall for salesmen of fertilizer manufacturing companies.

The ten sessions, scheduled for ten cities between October 12 and November 13, follow up last winter's unprecedented series of meetings across the United States and Canada which were praised by those attending as one of the most significant steps forward in the plant food industry in recent years.

Total attendance this year is expected to be almost 500. Last year more than 350 representatives of 156 fertilizer manufacturing companies attended the meetings, and many are returning with additional members of their sales and executive staffs.

This year's meetings will feature completely new material on down-to-earth basics for increasing fertilizer sales.

New slides, movies, and other visual aids will be used, and there will be skits depicting certain sales situations. The meeting programs will include several audience participation features.

Topics to be covered include: Sources of sales; buying motives; credit and the salesman; the plus from soil tests; planning your strategy; stretching selling time; low price vs. high quality; closing your sales; keeping your customer sold; the key to the customer's mind; making your job easier with sales tools; fertilizer—an investment, not a cost.

The sales meetings are offered as part of IMC's Full Orbit Customer Service program. The schedule of meeting cities and dates:

October 12-13—Kansas City, Mo.
October 15-16—Shreveport, La.
October 19-20—Atlanta, Georgia
October 22-23—Tampa, Florida
October 26-27—Raleigh, N. C.
October 28-29—Baltimore, Md.
November 2-3—New York, N. Y.
November 5-6—Columbus, Ohio
November 9-10—Indianapolis, Ind.
November 12-13—Minneapolis, Minnesota

Industry Meeting Calendar

DATE	EVENT	LOCATION	CITY
Oct. 14-16	Pacific N.W. Fertilizer Convention	Chinook Hotel	Yakima, Wash.
Oct. 15	Chemical Control Conference	Shoreham Hotel	Washington, D. C.
Oct. 15-16	Fertilizer Control Officials	Shoreham Hotel	Washington, D. C.
Oct. 19-20	Fertilizer Safety Section	LaSalle Hotel	Chicago, Ill.
Nov. 4-6	Fertilizer Industry Round Table	Mayflower Hotel	Washington, D. C.
Nov. 5-6	Far West Safety School	Hacienda Motel	Fresno, Calif.
Nov. 8-10	Nat'l. Fertilizer Solutions Assn.	Statler Hilton	St. Louis, Mo.
Nov. 9-11	California Fertilizer Association	Fairmont Hotel	San Francisco, Calif.
Nov. 12-13	Southwestern Safety School	Tropicana Motor Hotel	Pasadena, Texas
	1960		
Jan. 13-15	Agricultural Ammonia Institute	Statler Hilton Hotel	Dallas, Texas
Feb. 11-12	Midwest Industry-Agronomist Meet	Edgewater Beach Hotel	Chicago, Ill.
June 12-15	National Plant Food Institute	Greenbrier Hotel	White Sul. Spgs., W.Va
July 27-30	Southwest Fertilizer Conference	Galvez Hotel	Galveston, Texas

RESEARCH RESULTS AND REPORTS

Tailor-made plants are just around the corner, according to research workers at USDA's Beltsville. They have found two protein pigments from corn plants which can control characteristics such as flowering, height and fruiting by varying the color and intensity of the light applied to the pigments, as well as by modifying the pigment themselves. A report on this was set up as one of the highlights of the Khrushchev visit to Beltsville.

More beef, to the extent of an extra five or six pounds per critter, and an extra dollar for each pound of nitrogen is seen as the result of a 15-year series of fertilizer trials in California, conducted by the Pleasanton Plant Materials Center, government sponsored. NPFI's Dr. Bahme has been watching this, and supplied this report, which is available in more detail.

Bermuda, according to Georgia research,—when grown alone or with crimson clover, will profit the grower if he keeps potash levels high enough to replenish the high rate of potash removed from the soil by coastal bermuda grass and the clover. According to a 4-year study,—"the more we increased nitrogen rates, the more potash the grass and clover removed from the soil.

If you want this in detail, write American Potash Institute, 1102 16th Street, N.W., Washington 6, D.C.

Cotton seems to thrive almost regardless of spacing. At a recent tour of the Sand Mountain Station in Alabama it was pointed out that several years of testing showed that it makes no appreciable difference in yield whether the stalks are set 20,000, 40,000 or 60,000 per acre.

Semi-dwarf wheat seems to be an answer for Pacific Northwest growers. USDA, Washington, Oregon and Idaho stations are testing these Japanese-American blends, and find they resist lodging and stand erect on fertile soil with heavy N fertilization.

Maine dairymen are being warned, in the Maine Farm Research publication that nitrogen fertilization is necessary if they want maximum forage yields,—specifically 72 pounds of N per acre on bromegrass. Maine AES has also been going into giberellics as a seedpiece dip and as a spray on the foliage of potato plants just after full bloom. No recommendations yet, but the prospects don't sound so good.

Alabama farmers can use 2¾ times more plant food than they do according to the Alabama Soil Testing Laboratory at Auburn.

Chlorosis of citrus which show iron deficiencies from virus infection or from being grown in calcareous soils in the Rio Grande Valley can be corrected with Sequestrine 138 Fe, a highly effective iron chelate—according to joint research by the State and USDA.

STATEMENT OF OWNERSHIP, ETC.

Commercial Fertilizer and Plant Food Industry

AS OF OCTOBER 1, 1959

1. Publisher, editor, etc.: **Publisher:** Walter W. Brown Publishing Co., Inc., 75 Third St., N.W., Atlanta 8, Ga.; **Editor:** Clay W. Penick, Jr., 75 Third St., N.W., Atlanta 8, Ga.; **Business Manager:** V. T. Crenshaw, 75 Third St., N.W., Atlanta 8, Ga.

2. Walter W. Brown Publishing Co., Inc., 75 Third St., N.W., Atlanta 8, Ga.: Ernest H. Abernethy, 75 Third St., N.W., Atlanta 8, Ga.; Virginia T. Crenshaw, 75 Third St., N.W., Atlanta 8, Ga.; Allen W. Hill, Elon A. Abernethy, Jr., James W. Baker, Trustees for Ernest H. Abernethy, Jr., a minor under the laws of Georgia; Allen W. Hill, Elon A. Abernethy, Jr., James W. Baker, Trustees for James Elon Abernethy, a minor under the laws of Georgia.

3. Bondholders, mortgages, etc.: None.

Signed: **Ernest H. Abernethy,** President

Sworn to and subscribed before me, a Notary Public, this 17th day of September, 1959.

Mary C. Layman, Notary Public.

My commission expires February 29, 1960.

Research Grants

NPFI Aids Forest Research Projects

A research project on forest fertilization has been initiated by the University of Georgia Agricultural Experiment Stations, it was announced by George H. King, Director, Georgia AES. This project has as its objective a determination of the response of young slash pine to applications of certain plant nutrient elements and the effect of these treatments on wood quality. It is supported in part by a grant of $2,600 from the National Plant Food Institute.

Two more agreements have been entered into by the National Plant Food Institute with colleges in the Southeastern region of the United States to help partially finance research projects on forest tree fertilization, it was announced recently by L. C. Walker, Southeastern Regional Forester of the NPFI.

One agreement is with the School of Forestry, Raleigh, and provides for a grant-in-aid of $800 to be used in greenhouse and field experiments.

The second agreement is with the Georgia Coastal Plain AES. A grant of $500 was made to finance partially an investigation of the effect of water supply and nutrient applications on survival and growth of loblolly and slash pine seedlings.

Calspray Aids Forest Study in Washington

Washington State College researchers have received a $12,000 grant from California Spray-Chemical Corporation for a three year study of the problem of forest fertilization, it was announced by Dr. Malcolm H. McVickar, Calspray's chief agronomist.

The investigation will be carried on under the supervision of Dr. R. B. Bertramson, chairman, Department of Agronomy. First step in the project will be to run different chemical tests on areas receiving different types of fertilizer treatments. They will initially determine, whether testing techniques can be developed by which to gauge the response in forest areas to the addition of chemical nutrients.

In addition to the official test areas, the researchers will also have available the "fertility test blocks" which have already been laid out by a number of lumber companies in the vicinity.

Atomic Energy Grant To Duke Researcher

Better commercial crops and forests could result from a research project currently under way at Duke University.

Research, to improve fertilization practices is headed by Dr. Paul J. Kramer, James B. Duke Professor of Botany. Assisting him as a research associate is William Lopushinsky.

Intent of the research is to advance the knowledge of how trees and other plants absorb the mineral salts essential to their growth. A new $4,375 grant from the U.S. Atomic Energy Commission has been made to support the work.

Prof. Kramer is trying to determine specifically the path by which salt moves from the soil solutions surrounding the roots through the root tissues to the water-conducting system which carries it throughout the plant.

The research leader currently is vice president both of the Botanical Society of America and the American Institute of Biological Sciences.

NPFI Grant Goes to S.E. Forest Station

A grant of $800 has been made by the National Plant Food Institute to the Southeastern Forest Experiment Station of the United States Department of Agriculture for research on forest fertilization. The studies will be conducted on young loblolly pine trees growing in the Piedmont Section of South Carolina. The specific objective is a determination of the best time of year to sample the foliage in order to best relate the nutrient status of the tree with the availability of nutrients in the soil.

Dr. Carol Wells, soil scientist, and Dr. Louis J. Metz, leader, Forest Soils Research, at the Union Research Center, Union South Carolina, will supervise the investigations.

VPI Gets Grant From Potash Institute

Through a new $4,000 grant from American Potash Institute, Virginia Polytechnic Institute soils scientists have started searching for answers to this four-way question: How do various rates of potash fertilizers affect (1) the botanical composition and yield, (2) the ion uptake, (3) the seedling injury, and (4) the winter injury of certain forage crops.

Directed by Dr. R. E. Blaser, the 2-year project will study how different rates of potassium and nitrogen fertilizers affect the botanical and chemical composition of forage grasses that have received various rates of nitrogen.

Check Attitude On Fertilizer Use

Research workers at the Ohio Agricultural Experiment Station are beginning a study of the impact of demonstration plots upon farmers' attitudes toward fertilizer.

While the demonstration method has been widely used by Extension workers, teachers, and others for many years, little is actually known about the effectiveness of these demonstrations in convincing people to use new ideas. The National Plant Food Institute of Washington, D. C., has sponsored this study by a grant of $10,890 to the Departments of Agronomy and Agricultural Economics and Rural Sociology.

AOAC Marks 75 Years At October Meeting

Seventy-five years of service to the American consumer will be celebrated at the annual meeting of the Association of Official Agricultural Chemists to be held at the Shoreham Hotel, Washington, D. C., October 12-14. A.O.A.C. was founded in 1884 to establish reliable methods of analysis required for proper enforcement of fertilizer laws.

Ralph B. Douglass, chairman of the board, Smith-Douglass, congratulates one of the scholarship winners helped in the S-D program which has aided 209 students to date. The S-D grants, most of them for $1,000 allow four years at 11 colleges stretching from South Carolina to Minnesota. The selections are made by FFA, 4-H or college officials.

TONNAGE and REGULATION NOTES

Alabama Gains 15%

The 1958-59 Alabama fertilizer tonnage increased 15.3 per cent over the preceding year according to the Alabama Soil Fertility Society. Actual tonnage was 1,045,562 as compared with 906,834 tons in 1957-1958.

An important trend is indicated by the increased use of the 4-12-12 grade: 252,955 tons in contrast to 187,370 the preceding year. Unrecommended grades continued their downward trend. The plant food content in all mixed goods increased to 25.7 percent as compared with 24.9 percent in 1957-1958 and 24.4 percent in 1956-1957. The Alabama fertilizer story, sometimes referred to as the "high-low" fertilizer story is perhaps best told by the following table, showing percent of mixed fertilizer grades bought by Alabama farmers and that needed for high yields according to soil test information:

Years	High P Low K	Equal P-K	Low P High K
State Needs	7	79	14
1958-59	36	62	2
1957-58	40	57	3
1956-57	49	48	3
1955-56	69	29	2
1940-41	100	0	0

Georgia Penalties Under 1%

R. A. Moncrief, chief of the Fertilizer Section of the Georgia Department of Agriculture, State Chemist Harry Johnson, are high in their praise of the fertilizer industry during the past year because of the very low per cent of penalties assessed. Under one per cent of the fertilizer samples analyzed in the state laboratory were found to be deficient. During the past 15 years, penalties have run as high as six per cent at times.

Kansas Tonnage Up 46%

Kansas fertilizer sales reached an all-time high for the year ending last June 30 with the sale of 289,688 tons. This was 50,067 tons above the previous record of 1952-53, and 92,241 tons above the 1957-58 total. Tons of actual plant nutrient contained in the fertilizer sold reached a new high of 107,538 tons according to the Kansas Board of Agriculture's Control Division.

Biggest sellers were mixed fertilizers (52,181 tons) and ammonium nitrate (45,248 tons). A new grade listed this year was 15-10-10 with 1,725 tons sold.

Missouri Tonnage Up 16%

A significant 16 percent jump is the fertilizer consumption story in Missouri this year as sales climbed to 933,090 tons in 1958-59 as compared with 802,276 tons a year earlier. (These figures exclude rock phosphate sales included in the total shown in the tonnage table below.)

This year's tonnage figures, according to the University of Missouri Agricultural Experiment Station are 533,830 for mixtures and 399,260 for materials.

Sale of nitrogenous materials hit 128,411 tons, phosphatic materials amounted to 247,877 tons, and potash materials totalled 17,949.

W. Va. Sets New Record

Sales of commercial fertilizer in the first six months of 1959 totaled 60,397 tons, Agriculture Commissioner John T. Johnson, of West Virginia, reports.

The figure ran more than 1,000 tons above that for the comparable 1958 period. Mixed fertilizers comprised 88 per cent of the total tonnage.

Based on average fertilizer prices at mid-April, farmers' cash outlays in the six-month period, amounted to $3,200,000, as against $3,100,000 for the first half of 1958 and $3,400,000 for the same 1957 period.

The price of most fertilizers ranged 85 cents to $1 per ton higher than last fall, although some showed declines.

CF Staff—Tabulated TONNAGE REPORTS

FERTILIZER TONNAGE REPORT (in equivalent short tons) Compiled by Cooperating State Control Officials and Tabulated by COMMERCIAL FERTILIZER Staff

STATE	August		July		April-June Quarter		January-June		July-December		YEAR (July-June)	
	1959	1958	1959	1958	1959	1958	1959	1958	1958	1957	1958-59	1957-58
Alabama	------	22,611*	23,905	14,162	549,564	487,441	846,309	734,077	199,265	172,721	1,045,574	906,798
Arkansas	9,071	7,919	17,619	20,612	175,592	150,970	289,365	226,889	64,092	62,752	353,457	289,641
Georgia	32,120	23,557	80,725	68,610	955,705	798,310	1,130,998	944,618	294,751	269,529	1,425,749	1,214,147
Kentucky	------	10,302*	------	5,470*	307,715	290,423	483,821	435,023	99,460	88,771	583,281	523,794
Louisiana	8,426	6,069	13,972	10,214	122,382	120,744	201,642	188,409	64,152	64,192	265,794	252,601
Missouri	55,435	41,952	23,095	16,393	390,700	333,851	563,055	420,615	370,036	335,312	926,111	755,927
N. Carolina	------	17,319*	13,485	22,354	842,771	823,676	1,468,704	1,261,685	228,055	199,446	1,696,759	1,461,131
Oklahoma	9,853	8,448	6,567	5,689	38,937	35,804	64,738	55,964	68,848	51,436	133,586	107,400
S. Carolina	11,817	11,030	12,632	18,064	370,628	328,955	756,100	615,733	134,202	116,874	890,302	732,607
Tennessee	26,551	22,901	15,644	14,400	292,705	223,068	443,602	307,182	127,116	135,717	570,718	442,899
Texas	27,081	26,311	36,002	32,186	228,767	288,802	441,851	452,327	222,800	213,801	664,651	666,128
California		(reports compiled quarterly)			485,672	426,032	803,261	679,577	450,767	441,969	1,254,028	1,121,546
Virginia		(reports compiled quarterly)			303,300	331,222	618,965	549,773	160,178	140,783	779,143	690,556
Indiana			(reports compiled semi-annually)				856,316	795,506	316,341	284,959	1,172,657	1,080,465
New Hampshire			(reports compiled semi-annually)				16,143	16,053	4,746	3,966	20,889	20,019
Washington			(reports compiled semi-annually)				------	158,286*	75,350	77,498	------	235,784*
TOTAL	**180,354**	**148,187**	**243,646**	**222,684**	**5,064,438**	**4,639,298**	**8,984,870**	**7,683,431**	**2,880,159**	**2,659,726**	**11,782,699**	**10,265,659**

-------- (not yet reported) *** Omitted from column total to allow comparison with same period of current year.**

CLASSIFIED ADVERTISING

RATES: single issue, 8c per word; two issues, 12c per word; three issues, 15c per word: add 4c per word for each insertion beyond three issues. 'For Sale', 'Exchange' and 'Wanted' advertisements accepted for this column must be **paid in advance.**

POSITION WANTED

DESIRE TO RELOCATE IN SOUTH EAST: Over 12 years experience with same firm in sales and sales management of fertilizer and pesticide basic ingredients. Presently employed Assistant Management position administrating sales and activities of over 50 people. Present volume of around 20 million. Compensation commensurate with performance. Reply Box # 28, % Commercial Fertilizer and Plant Food Industry, 75 - 3rd St., N. W., Atlanta 8, Ga.

PLANT SUPERINTENDENT or CONTROL CHEMIST Graduate Chemist—has solved wide variety of processing problems for the leaders—reduced curing time and fines—developed patented processes—broad experience in acidulation and fluorine recovery—shirt sleeve approach. Box #31, % Commercial Fertilizer, 75 Third St. N. W., Atlanta 8, Ga.

Excellent 10 year record in sales management, sales of insecticides and fertilizers. M.S. degree in Agronomy and Agricultural Chemistry. Outstanding references. Desire new opportunity. Box #32, % Commercial Fertilizer, 75 Third St. N. W., Atlanta 8, Ga.

PLANT SUPERINTENDENT wishes to make a change. Over 20 years experience in mixed fertilizer including 18 months in granulation. Have managed both union and non-union labor. Married, 3 children, age 42. For reference and business resume, write box #33, % Commercial Fertilizer, 75-3rd St., N.W., Atlanta 8, Georgia.

HELP WANTED

WANTED—Manager for large fertilizer plant—North Midwest Area—Plant is large granulation plant with superphosphate facilities. Give complete resume of age, education, experience and availability in first letter. Box 34, % Commercial Fertilizer, 75 - 3rd St., N. W. Atlanta 8, Georgia.

USED EQUIPMENT FOR SALE

FOR SALE—1 New Stedman Type BX 20 x 18 Hammermill equipped with 4 row rotor with ⅞" manganese hammers and complete with 220V reduced voltage type compensator. Mill direct connected to 20 HP, 1200 RPM, 220/440 Volt, 3 Phase, 60 Cycle Totally Enclosed Fan Cooled Motor. Mill and motor mounted on integral base. Box # 20, % Commercial Fertilizer, 75 - 3rd St., N. W. Atlanta 8, Georgia.

FOR SALE—One F-33 DT (Sealed) Syntron Feeder with 12" wide x 36" long trough. Suspension mounting with FC33 controller, 440 volt, 60 cycle. 40-50 tons per hour. Used two months. $900.00. Farmers Fertilizer Co., Texarkana, Texas.

FOR SALE: Complete granular fertilizer plant including dryers, pulverizers, bagging equipment, etc. Aluminum Tanks, 18,000, 3,000 gal. Dewatering presses, Davenport #1A, #2A, #3A, Louisville 8-roll 36". Louisville Rotary Steam Tube Dryers, 6' x 50'. Screw Conveyor, Trough Belt Conveyor, Bucket Elevator, Bins, etc. Perry Equipment Corp., 1426 N. 6th St., Philadelphia 22, Pa.

FOR SALE: 2-7'6" x 55' and 80" x 65' Rotary Dryers, 3 - Louisville 6" x 50' Rotary Steam Tube Dryers, also Mixers, Storage Tanks, Screens, Elevators. Send us your inquiries. BRILL EQUIPMENT COMPANY, 2401 Third Ave., New York 51, N. Y.

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